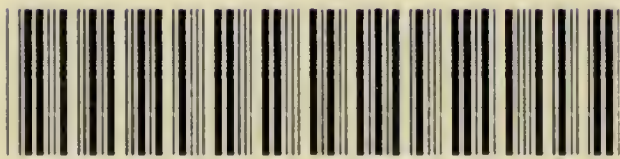


SURGERY

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CATECHISM SERIES

SURGERY

COMPLETE VOLUME

FIFTH EDITION

REVISED AND REWRITTEN

E. & S. LIVINGSTONE
16 & 17 TEVIOT PLACE, EDINBURGH

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1913

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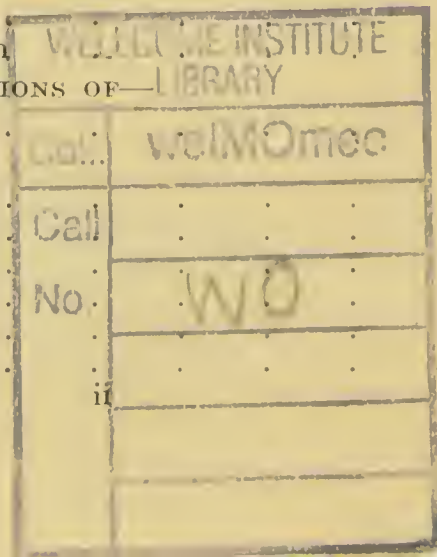
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SURGERY

PART I

SUPPURATION.

Describe Suppuration.

Suppuration may be acute, subacute, or chronic. The first two types occur within a week from the time of infection, the last, usually over a month. Chronic suppuration suggests the presence of tubercle bacilli, actinomycosis, syphilitic disease, or staphylococci of a mild type of virulence. Acute suppuration results from infection by pyogenic bacteria, such as the staphylococcus aureus et albus, streptococci, gonococci, pneumococci, and the bacillus coli communis. The acute form may be diffuse—*cellulitis*, or circumscribed.

In suppuration the toxins from the bacteria involved cause coagulation-necrosis of the invaded tissues, the latter being subsequently converted into pus through the agency of proteolytic ferments liberated by the dead leucocytes. A circumscribed collection of pus in the tissues is termed an *abscess*. Two types of abscess occur, acute and chronic, following upon acute and chronic suppuration respectively.

Pus is a yellowish opaque fluid of the consistency of cream which is composed of bacteria, pus serum, pus corpuscles, and broken-down tissue elements. It is usually alkaline in reaction with a specific gravity of about 1030, and has a characteristic odour. Sub-varieties are : (a) *sanious*, or blood-stained ; (b) *ichorous*, or watery ; and (c) *coloured*.

Give the Clinical Features of an Acute Abscess.

An acute abscess is red, hot, swollen, acutely tender, and the seat of throbbing pain. Fluctuation can usually be

detected. When superficial, the centre of the abscess tends to "point." In deeply-situated abscesses œdema of the overlying skin is generally noticed. The constitutional symptoms are those of inflammation, namely, malaise, rise of temperature (often an antecedent rigor), dry skin, furred tongue, headache, and constipation. A varying degree of leucocytosis is present.

What is the Treatment ?

General measures are discussed fully below but aim at the elimination of toxins, the building up of the patient's resistance and the administration of specific drugs, sera or vaccines.

In *superficial abscesses*, before softening has occurred, hyperæmia is induced by warm moist dressings or by Klapp's suction bell. When fluctuation is present the abscess should be incised under gas or local (ethyl chloride) anæsthesia. Adequate incision is essential and drainage may be required.

In *deeply situated abscesses* free incision and drainage are necessary, the incision being made at the most dependent part of the swelling and, if possible, in the line of a skin fold. In areas in close proximity to large blood vessels or nerves the abscess should be opened by Hilton's method, *i.e.* incise skin and deep fascia, then push a pair of closed sinus or artery forceps into the abscess and then open the blades of the forceps in a direction parallel to the main vessels and nerves. The incision is kept open by a drain of dental rubber which is stitched in position. Deeply situated abscesses usually require incision under general anæsthesia.

Distinguish between Lymphangitis and Lymphadenitis.

The lymphatics draining an infected area convey organisms and their toxins and may themselves become inflamed (lymphangitis). Clinically the affected lymphatics are visible as red streaks passing upwards from the primary focus and constitutional symptoms are usually severe.

Should the infection be carried to the regional lymphatic

glands (lymphadenitis) they become tender, enlarged, and may ultimately soften and form an abscess.

What is the Treatment ?

The affected part is kept at rest by the application of splints. Bier's method of producing passive hyperæmia—the application of a rubber bandage to the proximal part of the limb with sufficient tension to occlude the venous return—is employed. Anti-streptococcal serum and sulph-anilamide are of value. Local applications, *e.g.* 10 per cent. ichthyol in glycerine, antiphlogistine or linseed poultices, may be used. Incision must never be considered until the infection has localised and an abscess has formed.

Describe Acute Toxæmia (Sapræmia).

Acute toxæmia is due to the circulation in the blood of the toxins manufactured at the site of infection. The actual bacteria do not invade the blood stream. The condition is most severe when the infection involves a large area, a serous cavity, or when the pus is under considerable tension.

Clinical features.—(a) A feeling of chilliness or in severe cases a rigor ; (b) high temperature, 102–103° F. ; (c) rapid weak pulse ; (d) dry furred tongue ; (e) loss of appetite and constipation ; (f) in severe cases, delirium ; (g) negative blood culture.

A chronic type of toxæmia occurs mainly in tuberculosis, but is also found in the more chronic staphylococcal infections. A characteristic feature is the occurrence of a well-marked evening rise of temperature followed by a sudden fall upon the following morning. This fall is accompanied by profuse sweating. The patient loses weight and strength. Waxy degeneration tends to occur in the liver, spleen, kidneys, and intestines, resulting in ascites, albuminuria, œdema of the legs, and diarrhœa. The treatment is similar to that of acute sapræmia.

Describe Septicæmia.

Septicæmia is the name given when organisms invade the blood stream and proliferate in it. The general reaction is more severe than in acute toxæmia.

The clinical features are : (a) onset sudden with rigor and rise of temperature, $102-104^{\circ}$ F. ; (b) in grave cases the temperature is subnormal ; (c) rapid soft pulse ; (d) myocardial weakness, dilatation of the heart and murmurs of the hæmic type ; (e) dry furred tongue, severe thirst, vomiting and diarrhœa ; (f) petechial hæmorrhages on skin or mucous membranes ; (g) sleeplessness and delirium ; (h) leucocytosis except in the most virulent cases ; (i) positive blood culture, usually hæmolytic streptococci, but other pyogenic organisms may be found.

Describe Pyæmia.

Pyæmia is a septic toxæmia in which secondary abscesses develop. The disease is always secondary to a septic thrombosis of the veins at the seat of infection, and takes about a week to develop. From the disintegrating thrombus, emboli are conveyed by the blood-stream to various parts of the body, *e.g.* lungs, kidneys, brain, heart, parotid gland, etc. The commonest precursors of pyæmia are : (a) thrombosis of the lateral sinus in chronic otitis media ; and (b) osteomyelitis.

What are the Clinical Features ?

The patient experiences a rigor together with a sharp rise of temperature. Later the temperature falls almost to normal, leaving the patient bathed in sweat. Another rigor appears in a few days with a similar high temperature, followed by another fall. Secondary abscesses form within three to five days of the rigor. The remaining clinical features are those of a virulent septicæmia. The patient's breath has a sweetish odour resembling new-mown hay.

Describe the Treatment of Septicæmia.

General measures.—(a) Rest in bed with good nursing ; (b) copious fluids by mouth unless vomiting occurs when the fluid is given intravenously, subcutaneously, or rectally ; (c) relieve pain and secure adequate sleep for the patient by drugs ; (d) cardiac failure is treated by coramine or other stimulants ; (e) intravenous injection of 20-50 c.c. anti-

streptococcal serum ; (f) sulphanilamide preparations, *e.g.* prontosil, M.&B. 693, etc., may be given by mouth or by intramuscular or intravenous injection in doses up to gm. 1 every four hours ; (g) blood transfusion is of value in the later stages but immuno-transfusion has proved disappointing.

Local measures.—Complete removal or adequate drainage of the primary focus should be carried out.

Describe the Treatment of Pyæmia.

Remove, if possible, the primary septic focus, and in the case of the lateral sinus, in addition, ligate the internal jugular vein on the cardiac side of the thrombosis. Secondary abscesses, when accessible, are opened and drained as they occur. Bier's bandage is very useful when dealing with septic compound fractures. In cases not yielding to these measures, amputation of the limb may be necessary. The general treatment for septicæmia is carried out.

Give the Clinical Features of Cellulitis.

Cellulitis is an infection of the subcutaneous tissues and usually results from a small wound, the infecting organism in most cases being the streptococcus. The organisms spread in the loose tissue and the process rapidly extends to a considerable distance from the wound. Infiltration of the tissue planes causes greatly increased tension with impairment of the blood supply and extensive sloughing and necrosis may occur.

The affected area is swollen, dusky red in colour, hot and tender, and in the early stages feels brawny, but later softening occurs, producing the characteristic boggy feeling. Lymphangitis and lymphadenitis are frequently present and the general symptoms are those of septicæmia. If untreated, the pus burrows widely, blisters containing sero-pus form on the skin which eventually gives way.

What is the Treatment ?

The general treatment of septicæmia is employed. Local therapy comprises complete rest of the part, hyperæmia by

means of fomentations, radiant heat or Bier's passive congestion. When softening occurs free incisions are made down to the deep fascia and, in extreme cases, amputation of the limb may be required to save the patient's life.

Describe Erysipelas.

An acute streptococcal condition which may affect a wound of the skin or mucous membrane. The incubation period varies from one to two days.

Several varieties are described : (a) facial ; (b) neonatorum, the organisms gaining access through the umbilicus at birth : (c) phlegmonous, a diffuse cellulitis ; (d) puerperal, really a parametritis.

Under appropriate treatment the disease is usually recovered from, although repeated attacks are apt to leave a chronic œdema of the parts. Dangerous complications may, however, occur, such as meningitis, œdema glottidis, and general toxæmia.

Owing to the infectious nature of the discharge the disease is notifiable, although only locally contagious.

What are the Clinical Features ?

The initial symptoms are malaise, headache, vomiting, and often pain in the loins. A feeling of chilliness is noticed or a definite rigor may occur. The temperature rises to 102° or 103° F., the pulse and respirations are quickened, gastro-intestinal derangements, such as constipation, want of appetite, and a dirty tongue are present ; the urine is scanty and often contains albumin ; delirium sometimes supervenes, and a mild leucocytosis is of frequent occurrence.

Locally, the affected area is florid in appearance, slightly raised above the surface, smooth, and covered with scattered bullæ filled with clear serum. It is hot and tender on palpation. On the periphery of the swelling is a narrow zone, which is extremely sensitive to touch. Superficial lymphangitis occurs in the lymphatics leading from the affected part, and the associated glands are swollen and tender.

What is the Treatment ?

The general measures for septicæmia are again applicable. Local treatment is of little value. An area extending one inch outside the lesion may be painted twice daily with tincture of iodine, but soothing lotions give more relief. The introduction of anti-streptococcal serum and sulph-anilamide have made local treatment of only secondary importance.

What is a Whitlow ?

A whitlow is an acute septic inflammation of a finger or toe. There are five varieties, the classification depending upon the anatomical site of the infection :—

- (a) Sub-cuticular (the purulent blister).
- (b) Around the nail sulcus (paronychia).
- (c) Subcutaneous.
- (d) In the tendon sheath (acute teno-synovitis or thecal whitlow).
- (e) Sub-periosteal.

Each of these types merits special description.

Describe Sub-cuticular Whitlow and give the Treatment.

Infection results from a prick of the finger and pus forms between the dermis and the epidermis. A blister forms and the pus is visible through the thin epidermis. The diagnosis is obvious.

The raised epidermis should be removed with scissors and the pus is wiped away and careful inspection of the surface made so that no communication with the subcutaneous space may be missed.

Describe Nail-fold Infections and give the Treatment.

Infection under the nail-fold may result from injuries during manicuring and it may be acute or chronic.

Acute paronychia.—An abscess forms deep to the nail-fold and the pus may track round the nail sulcus or may pass deep to the nail which becomes floated off the nail bed. The nail-fold is swollen and painful and pus may be seen

deep to the nail. In the early acute case it is sufficient to open the abscess by an incision through the nail-fold in line with the outer edge of the nail. In more severe cases a similar incision is made on the other side and the flap thus outlined is raised. If pus has undermined the nail it may be necessary also to avulse the nail or to remove part of it. In all cases a general anæsthetic should be given.

Chronic paronychia.—This condition results from a small ulcer on the deep surface of the nail-fold. Pus collects in the nail sulcus and eventually lifts the eponychium from the nail and the pus escapes. The pain subsides and the eponychium again becomes adherent and the cycle is then repeated. Simple treatment by soaking the finger in warm boric lotion and packing the nail-fold away from the nail by inserting threads from a piece of boric lint with the blunt end of a needle is satisfactory. The nail-fold is not allowed to fall back into place until the ulcer has healed.

Describe Subcutaneous Whitlow.

This is really a cellulitis of the finger and it causes severe throbbing pain, the finger becomes swollen and its movements are impaired but not lost.

A special variety occurs in the terminal compartment of the finger and is known as a *pulp infection*. Its importance lies in the liability of this part of the finger to injury and because it forms a closed compartment where the inflammatory exudate causes a great increase in tension. The blood supply to the terminal four-fifths of the distal phalanx leaves the main vessel after it has entered this closed space and the tension rapidly leads to necrosis of this part of the bone. There is severe pain over the distal phalanx and the pulp of the finger is hard and exquisitely tender. Constitutional symptoms may or may not be present in subcutaneous whitlow.

What is the Treatment?

In subcutaneous infection of the finger general anæsthesia should be employed and the finger incised as soon as pus has formed. The incision is made along the antero-lateral border of the finger. It is deepened and the tendon sheath

is inspected. Drainage is provided for. In pulp infections the pulp of the finger is opened by a lateral or by two lateral incisions and the knife is passed across to the other side, dividing the fibrous septa joining the skin to the periosteum. If necrosis of the terminal phalanx has occurred the sequestrum should be removed.

Describe Thecal Whitlow (Acute Tenosynovitis).

Infection of the tendon sheath usually follows a prick of the anterior surface of the finger through one of the flexor creases where the sheath lies nearest the surface. Careless incision of a subcutaneous whitlow may infect the sheath, but extension to the sheath may occur from any septic focus in the vicinity. The constitutional signs are those of acute toxæmia.

The local signs in the middle three fingers are : (a) the finger is held in the semi-flexed position ; (b) the finger, as a whole, is swollen ; (c) any attempt to extend the finger by passive movement causes acute pain ; (d) the patient is unable to extend the finger, but may be able to flex it slightly ; (e) acute tenderness over the line of the sheath.

In the case of the thumb and little finger additional signs are usually present owing to the likelihood of extension to the radial and ulnar bursæ (*vide infra*).

Describe the Treatment.

Under general anæsthesia a tourniquet is applied and an antero-lateral incision is made to avoid injury to the digital vessels and nerve. The fibrous sheath is displayed and opened. If there is infection of the sheath the synovial lining will prolapse. The sheath is then opened and if the tendon has sloughed it is removed. The incision may need to be extended to overlie the entire sheath to secure adequate drainage.

Describe Radial Bursitis.

Infection of the radial bursa usually follows a thecal whitlow of the thumb, but spread to the bursa may be a sequel to ulnar bursitis. The signs and symptoms of acute

toxæmia are usually well marked. The local signs are : (a) the thumb is swollen ; (b) thumb held in semi-flexed position ; (c) no active extension of the thumb possible, but slight flexion may occur ; (d) passive extension is impossible and causes severe pain ; (e) acute tenderness over the line of the sheath, *i.e.* extending from the distal thumb crease to the upper limit of the sheath ; (f) slight swelling of the thenar eminence and œdema of the dorsum of the hand are commonly found.

Describe the Treatment.

An antero-medial incision is made over the proximal phalanx of the thumb and the sheath is opened. This incision is extended upwards along the inner margin of the thenar eminence, but stops $1\frac{1}{4}$ – $1\frac{1}{2}$ inches below the distal wrist crease to avoid injury to the nerve to the thenar muscles. A probe passed upwards from the lowest part of the incision enters the bursa which is widely opened and drained. General anæsthesia and a tourniquet are essential.

What are the Clinical Features of Ulnar Bursitis ?

Infection of the bursa occurs from thecal whitlow of the little finger, radial bursitis, middle palmar space infection and wounds of the palm in that order of frequency. It may follow thecal whitlow of the third and fourth fingers.

The signs of thecal infection are usually present in the little finger, the constitutional signs are those of acute toxæmia, there is œdema of the dorsum of the hand and tenderness is acute over the bursa. The fingers are held in a semi-flexed position and passive extension causes severe pain. Maximum pain and tenderness are found at the point where the distal transverse palmar crease crosses the tendons of the fifth finger (Kanavel's sign).

Describe the Treatment of Ulnar Bursitis.

The sheath of the little finger is opened in the usual way by an antero-lateral incision and this incision is then continued upwards into the palm in the line of the bursa and can be made as far proximal as the transverse carpal

ligament without injury to vessels or nerves. Drainage is established.

What are the Boundaries of the Thenar Space ?

The thenar space lies to the outer side of the palm of the hand and has the following boundaries :—(a) *posteriorly*, the transverse head of adductor pollicis ; (b) *laterally*, the tendon of flexor pollicis longus lying in the radial bursa ; (c) *medially*, a fibrous partition separates it from the middle palmar space ; (d) *anteriorly*, the muscles of the thenar eminence, the flexor tendons to the index finger and the first two lumbrical muscles. The space extends proximally to the lower border of the transverse carpal ligament and distally it is continuous with the first or first and second lumbrical canals.

How may Infection reach the Thenar Space ?

Primary infection of the thenar space may follow penetrating wounds, but secondary infection is more common. It is a sequel to subcutaneous whitlow or tenosynovitis of the index finger by means of the lumbrical canal. Similarly middle finger infections may spread via the second lumbrical canal to the thenar space which is also infected from the radial bursa or following osteomyelitis of the metacarpal bones.

Describe the Clinical Features of Infection of the Thenar Space.

Symptoms of toxæmia are well marked and there is usually a primary source of infection. The local signs are that the thumb metacarpal is displaced laterally and the thumb takes up a semi-flexed position which can be overcome by passive movement with little discomfort. The thenar eminence is ballooned and tenderness cannot be localised with accuracy to any definite area.

What is the Treatment ?

Drainage of the space must be carried out under general anaesthesia and a tourniquet should be applied. Alternative exposures are : (a) an incision along the radial border of

the second metacarpal bone on the dorsum of the hand and forceps are passed through the adductor pollicis into the space ; (b) an incision along the dorsal edge of the web of the thumb and the insertion of a forceps into the space along the interval between the adductor pollicis posteriorly and the thenar muscles anteriorly.

What are the Boundaries of the Middle Palmar Space ?

The space lies deep to the inner part of the hollow of the palm of the hand. Its boundaries are : (a) *posteriorly*, the metacarpal bones and interossei covered by a layer of fascia ; (b) *anteriorly*, the flexor tendons, ulnar bursa, and third and fourth lumbricals ; (c) *laterally*, it is separated from the thenar space by a fibrous partition ; (d) *medially*, the muscles of the hypothenar eminence ; (e) *distally*, it communicates with the third and fourth or second, third and fourth lumbrical canals ; (f) *proximally*, it extends upwards to the lower border of the transverse carpal ligament.

How may it become Infected ?

The space may be infected from subcutaneous or thecal whitlow of the third or fourth fingers by means of the lumbrical canals, by extension from the ulnar bursa, by direct implantation and, possibly, following osteomyelitis of the metacarpals.

What are the Clinical Features ?

Systemic signs are marked and the signs of the primary focus, which may already have been incised, are usually present. Infection of this space is the only condition which converts the normal concavity of the palm into a convexity. There is no local point of maximum tenderness.

What is the Treatment ?

Under gas or other general anæsthesia a tourniquet is applied and the space is drained through an incision in the web between the little and ring fingers or that between the ring and middle fingers. The incision begins on the dorsum

of the web and passes forwards and proximally to the distal palmar crease. Forceps are then passed along the lumbrical canal deep to the flexor tendon into the space.

Describe the Forearm Space.

The forearm or Parona's space lies deep to the tendons of the flexor digitorum profundus and superficial to the pronator quadratus muscle and it extends laterally to the sides of the forearm. At its lower end the uppermost parts of the ulnar and radial bursæ are in intimate relationship with it. It is also continuous with the middle palmar space.

How does this space become Infected ?

Infection may follow infection of the middle palmar space, the ulnar or the radial bursæ. The clinical features are a painful hard swelling of the lower part of the forearm, associated with the signs of one of the other hand infections.

What is the Treatment ?

The space is opened by an incision just anterior to the ulna and forceps are passed into the space deep to the flexor tendons. In severe cases through-and-through drainage may be secured by a similar incision in front of the radius.

Describe Infections of the Dorsum of the Hand.

Infection of the back of the hand may arise superficial or deep to the aponeurosis which unites the extensor tendons of the fingers. Infection superficial to the aponeurosis is *subcutaneous* and deep to it is known as infection of the *sub-aponeurotic space*. Infection may be direct implantation or it may follow infection of the web of a finger or again it may be lymphatic in type. The only difficulty in diagnosis is to distinguish these infections from the œdema so constantly seen in the dorsum of the hand in the major hand infections.

When pus has formed incision should be carried out and in the case of the deeper type of infection it should avoid the extensor tendons.

Contrast Sinuses and Fistulæ.

A *sinus* is a long, narrow suppurating track in the tissues, opening on the skin or into a mucous cavity ; it has accordingly only one opening. The orifice of a sinus is often depressed below the level of the surface. Sinuses are either septic or tubercular. The wall of the sinus is lined with granulation tissue.

A *fistula* is an abnormal, long, and narrow canal connecting together two surfaces of the body, as skin with a mucous cavity, *e.g.* gastric, biliary, salivary, and anal fistulæ ; or linking up two mucous cavities, *e.g.* vesicovaginal fistula. A fistula has therefore two openings. The walls of the fistula frequently possess an epithelial lining. Congenital fistulæ also occur, *e.g.* branchial and urachal.

Sinuses and fistulæ tend to persist because of (a) imperfect drainage ; (b) the presence of dead bone or a foreign body at the bottom ; (c) movement of the parts ; (d) the passage of secretions or excretions along the track, *e.g.* urine in urinary fistulæ, mucus or thin faeces in fistula-in-ano ; (e) rigidity of the abscess wall as in empyema ; and (f) the epithelial lining of the canal.

Give the Treatment.

The treatment varies with the site and nature of the sinus or fistula and various types of fistulæ will be described in the other sections. Excision of the sinus or, if this is impossible, scraping and cauterisation may be performed.

SPECIFIC INFECTIONS.

Tuberculosis and Venereal Diseases are described in other books in the series.

Describe Actinomycosis.

This is a chronic form of suppuration caused by a streptothrix (the ray fungus). The disease is probably conveyed by the husks of barley, and is most common during the

harvesting season. It corresponds to the "wooden tongue" of horned cattle. In human beings, the affection usually commences in the cavity of a carious tooth or in a tonsillar crypt, and affects the mandible and the floor of the mouth at an early stage. Later on the lungs, stomach, liver, or cæcum become involved.

Give its Clinical Features.

A swelling, moderately painful, but not tender, occurs in connection with the jaw or pharynx. It grows slowly, does not affect the lymphatic glands, and for a time causes no constitutional disturbance. The surrounding tissues gradually suppurate, and the pus works its way to the surface, leaving sinuses. The pus is somewhat greenish in colour, and contains groups of the fungus resembling sulphur grains or red pepper. Three or four weeks elapse between infection and the appearance of the characteristic discharge. When confined to the jaw (usually near the angle) the disease has to be diagnosed from (a) a periosteal gumma; (b) a gumma; and (c) tubercle. If the case is neglected, chronic sapræmia ensues.

What is the Treatment?

Where possible, excision, or scraping the affected part with a sharp spoon, is indicated. Iodide of potassium in large doses is given internally. A vaccine containing twenty to twenty-five million fragments of the fungus may be given. Other remedies recommended are X-rays or radium before sinus formation occurs.

Describe Tetanus.

The tetanus bacillus is an anaerobic organism having its habitat in soil, garden refuse, and stable dirt. The average incubation period is four days; it may, however, extend to three weeks. The longer the incubation, the more favourable the prognosis. Infection occurs through a wound which may be quite insignificant, through contaminated eatgut or in infants through contamination of the umbilical area. Several varieties are described, namely:

(a) acute ; (b) chronic ; (c) cephalic ; and (d) neonatorum. The characteristic features of tetanus are due to the action of the toxins on the spinal, pontine, and bulbar nerve centres. These toxins travel along the main nerve trunks.

Give the Clinical Features.

(a) Attacks of clonic spasms occurring first in the muscles in the vicinity of the wound.

(b) Between the attacks the muscles remain spastic ; this spasticity persists during sleep.

(c) Rigidity of the body, coming on usually in the following order : jaw, neck, anterior abdominal wall, dorsum of trunk, thorax and extremities.

(d) When the spasms affect the trunk muscles, the patient assumes an attitude. Most commonly the body becomes curved backwards, until the patient rests upon the heels and the occiput—opisthotonos.

(e) Trismus, *i.e.* a difficulty in opening the mouth (“lock-jaw”).

(f) The angles of the mouth are drawn backwards, the risus sardonicus.

(g) The temperature is generally raised.

(h) During the spasms signs of partial asphyxia come on ; the pupils dilate and the body is bathed in perspiration.

(i) Obstinate constipation and retention of urine.

(j) Even in the late stages the mental condition is unaffected.

Give the Treatment.

Prophylaxis.—All cases of wounds which may have become infected with tetanus should have a prophylactic inoculation of 5000 units of tetanus antitoxin in addition to the local wound treatment. The passive immunity induced by this method is transient and active immunity may be produced by the injection of tetanus toxoid in two doses of 1 c.c. each with an interval of six weeks between doses. This method is of value in those especially liable to tetanus infection, *e.g.* soldiers.

Treatment of the established case has four aims :—

- (a) To neutralise the toxin which is manufactured locally at the site of infection.
- (b) To allay or prevent spasms and secure sleep for the patient.
- (c) To ensure nourishment of the patient.
- (d) To treat the wound without causing increased absorption of toxin.

Tetanus antitoxin is given by the intravenous route in doses of 100,000 units or more. There is no evidence that intra-thecal or intramuscular therapy is of more value than intravenous injection. In severe cases an anæsthetic may be necessary for the injection. The patient is kept absolutely quiet in a dark room and avertin per rectum in doses of 1 c.c. per kilogram of body weight is the most effective sedative.

The nourishment of the patient is a problem which may be overcome by rectal or intravenous salines, and it is often possible to pass a stomach tube which is retained for as long as it can be tolerated.

Interference with the wound should be minimal until the serum has been absorbed and dressings of hydrogen peroxide or potassium permanganate are applied. Complete excision of the wound is theoretically ideal, but in many cases it is only possible to lay the wound open and so inhibit the growth of anaerobic organisms.

Describe Anthrax.

Anthrax is due to the *B. anthracis* or its spores, and occurs in two varieties: (a) as woolsorter's disease when caused by the spores; and (b) as a malignant pustule when caused by the bacilli. Malignant pustule follows a scratch or abrasion on the arms, face, or neck in workers amongst hides from infected cattle. Cases have been reported from infection by shaving brushes. It is especially dangerous when occurring on the neck or face, as in the former situation, œdema of the glottis commonly follows, and on the face intracranial complications may result from infection *via* the emissary veins. The incubation period varies from twelve hours to four days.

Mention its Clinical Features.

At the seat of infection a small reddish papule appears ; this quickly becomes vesicular, the blister usually containing a sanious fluid. The vesicle ruptures and is replaced by a black scab. Surrounding the latter is a zone of hyperæmia, which develops fresh blisters, these subsequently forming a scab. Accordingly, a typical malignant pustule presents three areas : (a) scabs ; (b) vesicles ; and (c) hyperæmia and œdema. The pustule is very itchy, and the patient complains of a burning sensation in it. Lymphadenitis of the neighbouring glands occurs.

Constitutional symptoms are not severe until the disease becomes generalised throughout the body, anthracæmia. Headache, dizziness, and a slight rise of temperature are the common features.

In anthracæmia the signs are :—

- (a) Rapid and weak pulse.
- (b) Temperature rising to 103° or 104° F.
- (c) Vomiting and diarrhœa.
- (d) Hæmaturia.
- (e) Rapid and shallow breathing.
- (f) Delirium.

An anthrax pustule must be diagnosed from a boil, carbuncle, or cutaneous septic lesion.

Give the Treatment.

In early cases the pustule may be completely excised and the wound cauterised. In later cases the fear of increasing the spread of infection makes excision inadvisable and ordinary antiseptic dressings are applied. Selavo's anti-anthrax serum is given intravenously in doses of 40–80 c.c.

Describe Glanders.

This is a disease caused by the bacillus mallei. It is common in equine animals, but rare in human beings. In the latter the incubation period averages three to five days. Glanders occurs in men working amongst infected horses, particularly in grooms, ostlers, veterinary surgeons, and

blacksmiths. Infection takes place through an abrasion of the skin, or the mucous membrane of the nose or mouth.

Give the Clinical Features.

Two varieties of the disease are described, acute and chronic.

Acute.—Usually commences as a papule which quickly ulcerates. Sometimes an erysipelas-like condition with lymphangitis and lymphadenitis occurs. When affecting the mouth or nose, it begins as a catarrh with a copious foul-smelling blood-stained discharge; destructive ulceration soon follows.

The acute variety generally passes into a pyæmic condition, with secondary abscesses in muscles and abdominal viscera. The specific organisms are difficult to find in the pus. A bright-red rash may form, the spots appearing in crops every third or fourth day. The rash does not possess any typical distribution. The remaining clinical features are those of pyæmia.

Chronic.—Indolent ulcers form on the affected part with induration of the neighbouring lymphatics. The ulcers spread slowly, showing no tendency to heal. Metastatic abscesses may develop.

When the diagnosis is doubtful, Straus' test can be employed. An emulsion of the suspected tissue is injected into the peritoneal cavity of a young male guinea-pig. An acute hydrocele follows in a few days in the fluid of which the bacillus mallei will be detected.

What is the Treatment?

Where practicable, excision of the affected area should be performed. If not, it should be scraped and swabbed with pure carbolic acid. Abscesses are dealt with as in pyæmia. Internally, potassium iodide, mallein, and vaccines have been tried. The disease is very intractable.

Describe Diphtheria.

This disease is due to the Klebs-Loeffler bacillus, and it spreads by contact with affected individuals, and by milk,

cats, and fowls. The incubation period varies from two to seven days. Locally a false membrane forms on the fauces, soft palate, and tonsil. From there it may spread: (a) down the respiratory tract; (b) along the Eustachian tube into the middle ear; (c) through the posterior nares into the nose; and (d) up the nasal duct, and affect the conjunctiva. The membrane is composed of epithelial debris, fibrin, blood corpuscles, and organisms; it has the appearance of a dirty white kid glove.

The organisms do not circulate in the blood, but remain localised, the toxin being conveyed by the blood-stream. The latter may cause paralysis of the soft palate and degeneration of the cardiac musculature.

Give the Clinical Features.

(a) Fever.

(b) Hyperæmia, and swelling of pharyngeal and palatal mucosa.

(c) Development of the false membrane. At first this can be readily detached; later it becomes adherent to the tonsil.

(d) Enlargement of the upper deep cervical lymphatic glands.

(e) Dysphagia.

(f) Dyspnœa.

(g) Great prostration.

In suspected cases a swab should be sent for bacteriological examination.

What is its Surgical Importance?

Obstruction of the air passages by the membrane may require urgent intubation or tracheotomy.

Post-diphtheritic paralysis may be confused with other lower motor neurone lesions.

WOUNDS.

Wounds of the soft parts may be either *subcutaneous*, comprising contusions and hæmatomata, or *open*, the latter being subdivided into incised, lacerated, and punctured. The former arise from violence applied by blunt objects; in areas where the soft parts are tightly stretched over the subjacent bone, such as the scalp, open wounds result from injury by blunt instruments.

Describe Contusions.

There are three degrees of contusion, namely: (a) affecting the skin only, the ordinary bruise; (b) blood extravasation into the superficial tissues; and (c) subcutaneous laceration of the soft parts. The main clinical features of contusion are shock, pain, swelling, and discoloration. Swelling may arise from rapid serous effusion, from extravasation of blood, or from superadded inflammation. The repair of a bruise is generally complete, the blood-clot becoming organised or reabsorbed, while the hæmoglobin undergoes oxidation, and passes through various colour changes, purple, bluish-black, greenish and yellow. Repair may be incomplete from the formation of a blood-cyst, or from the onset of sepsis.

When the injury has ruptured the small vessels in the superficial tissues, blood may be extravasated. This is best seen in those parts where the tissues are loose, *e.g.* eyelids and scrotum. If the blood escapes into a connective tissue space, a *hæmatoma* results. Contusions and hæmatomata are treated by rest, elevation of the part, and if seen early, by elastic pressure. When extravasation has ceased, massage is necessary to aid absorption. Blood-cysts should be excised.

Contrast the Varieties of Open Wounds.

(a) *Incised* are characterised by the length being greater than the breadth. They are generally produced by sharp instruments and bleed readily. The edges are gaping. When large vessels are divided, hæmorrhage is very profuse.

(b) *Lacerated* or contused are produced by tearing or dragging forms of violence, as in machinery accidents. There is great irregularity of the surface and edges, and a comparative absence of bleeding. Shock is often a marked feature.

(c) *Punctured*.—In this variety of wound the depth is greater than the length or breadth. They are especially dangerous, as organisms are carried deeply into the tissues, large blood-vessels may be incompletely divided, and viscera may be perforated.

How are Accidental Open Wounds dealt with ?

- (a) Arrest of hæmorrhage.
- (b) Cleansing.
- (c) Examination.
- (d) Treatment of the wound.

Arrest of Hæmorrhage.—As a temporary measure pressure must be applied. This can be done over the site of bleeding either digitally or by a pad firmly bandaged round the part. Where a large artery in a limb has been severed a tourniquet may be necessary to control the bleeding until the vessel can be secured. For the permanent arrest of hæmorrhage, small vessels can be secured with artery forceps and torsion employed. Large vessels should be ligated or sutured according to the degree of damage. Hot water, to which a little adrenalin has been added, is useful for oozing.

Cleansing.—Cover the wound with an aseptic dressing, and clean the surrounding area. Hairy parts must be shaved; the skin is scrubbed with soap and water and painted with tincture of iodine. Now expose the wound and cleanse it.

Examination.—Note the extent and depth of the wound, the presence or absence of foreign bodies, damage to blood-vessels, nerves, or tendons, fracture of the underlying or neighbouring bones, and when in the vicinity of a joint, if the joint has been penetrated.

Treatment of the Wound.—The skin edges are excised, using a sharp scalpel, thus removing the devitalised and infected tissue—*débridement*. The remainder of the wound

is then treated in a similar way, all injured tissue being removed. Foreign bodies are removed and every part of the wound is carefully explored. If thorough cleansing and excision is carried out the wound can be closed by primary suture. Interrupted stitches are inserted and all tension is avoided. If suture is impossible owing to the loss of tissue a pack is inserted, impregnated with acriflavine paraffin emulsion or vaseline, and the limb is immobilised in plaster of Paris. If closure is successful rest of the part is equally important and a splint or plaster is applied.

In cases where oozing or collection of serum is probable a drain should be inserted.

In cases where there is gross sepsis and destruction excision is carried out as completely as possible and the wound is left open. The wound may then be treated by packing and immobilisation or it may be treated by antiseptics and a secondary suture performed later. The most commonly used antiseptics are Eusol or Dakin's solution and the method is known as the Carrel Dakin treatment. Trueta has recently shown that good results follow the former method.

Describe the Hypochlorite (Carrel's) Treatment.

The wound is freely opened up and all grossly damaged tissues removed. Small rubber tubes, one or more according to the area of the wound, are introduced. These tubes are ligatured at the distal end, and have small lateral perforations. The solution is gently instilled with a glass syringe. When there are several tubes it is simpler to connect them to a glass distributor, which in turn is joined to a small glass reservoir. The fluid is allowed to trickle slowly into the wound. From ten to thirty cubic centimetres are sufficient for each instillation, which is given every two hours. The wound is dressed with pieces of plain gauze. Redressing is carried out daily or every two days.

The fluid used is called Dakin's. It is a solution of sodium hypochlorite free from caustic soda. The strength lies between 0.45 per cent. and 0.5 per cent. of sodium hypochlorite. Owing to its instability, it should be kept away from light.

The general treatment of open wounds consists in combating shock, elevation of the part, the securing of rest by suitable splinting, alleviating pain by morphia, and the elimination of toxins.

HÆMORRHAGE.

Describe Hæmorrhage.

Hæmorrhage is the escape of blood from a vessel. It is classified according to the type of vessel involved, *i.e.* arterial, venous and capillary hæmorrhage. In *arterial* bleeding the blood escapes from the proximal end of the divided vessel in spurts synchronous with the pulse and is bright red in colour. *Capillary* bleeding results in a steady ooze of red blood whereas in *venous* hæmorrhage the bleeding occurs from the distal end of the divided vein in a steady flow of dark red blood.

A further classification depends on the time of the onset of the bleeding : *primary* hæmorrhage follows immediately on receipt of the injury ; *reactionary* hæmorrhage follows during the stage of recovery from shock ; and *secondary* hæmorrhage occurs at a later stage and is due to sepsis with ulceration of the wall of a blood-vessel.

Should bleeding occur on to the surface of the body it is referred to as *external* hæmorrhage, and bleeding into the tissues or body cavities is called *internal* hæmorrhage.

Bleeding from certain special sites is referred to in special terms, *e.g.*

- epistaxis*, bleeding from the nose ;
- hæmoptysis*, the spitting of blood from the lungs ;
- hæmatemesis*, the vomiting of blood ;
- melæna*, the passage of blood per rectum.

Describe the Treatment of External Hæmorrhage.

The immediate or first aid treatment in capillary bleeding consists in the application of a dressing or of firm pressure to the wound. In venous bleeding the part should be

elevated and a pad firmly applied below the wound. Arterial bleeding will often stop with the application of firm pressure to the wound, but it may be necessary to control the vessel by pressure against the bone at a higher level, and if all simpler means fail a tourniquet is applied just proximal to the wound.

What are the Signs of Hæmorrhage ?

The loss of small amounts of blood is not accompanied by systemic signs, but following the loss of larger amounts of blood the skin becomes cold and pale and the temperature is subnormal. The pulse rate rises and the volume is diminished, and in severe cases the pulse is imperceptible. The patient is restless and complains of severe thirst. The loss of hæmoglobin leads to anoxæmia and the respiratory rate is increased and the respiration shallow. The blood pressure falls. At first the patient is conscious, but later becomes stuporose and finally consciousness is lost.

SHOCK.

Describe Shock.

Shock may be defined as a depression of the vital functions of the body following injury. Two types of shock are recognised :—

(a) *Primary Shock* follows immediately on receipt of the injury and is analogous to fainting. It is due to the stimulation of nerve endings and is more marked in the highly strung type of person. In injuries of areas with a large sensory nerve supply primary shock is more severe and may even result in sudden death. The patient may feel faint, the temperature is below normal, pallor and sweating of the skin, shallow respiration and rapid pulse complete the picture. Treatment in the recumbent position, relief of pain by morphine and warmth are sufficient to ensure recovery.

(b) *Secondary Shock*.—The exact cause of this type of

shock, which comes on insidiously some hours after the injury, is not known. It is known that certain factors predispose to it, *e.g.* exposure, fluid loss, fatigue and pain, and although the signs of shock are like those of hæmorrhage the two conditions are quite distinct although they may both be present at the same time. Theories of its causation are : (1) excessive stimulation of nerve endings : (2) failure of the adrenal glands ; (3) absorption of toxic substances from the wounded area. *Whatever the cause the fact remains that there is a fall in the circulating blood volume either from loss of blood, loss of fluid into the injured part, or by the damming up of blood in the dilated capillaries.* The fall in blood volume means a decrease in the heart's output and deficient circulation, so that suboxidation of the tissues results. The capillary walls will suffer damage if the blood pressure remains low, and fluid escapes into the tissues, thus still further reducing the blood volume.

The symptoms and signs are pale, sweaty skin, with slight cyanosis, subnormal temperature, increased pulse rate, and a fall in blood pressure.

What is the Treatment ?

The onset of shock may be prevented or its severity lessened by relieving the pain of the injury, *e.g.* splinting a fracture ; by warmth and by the giving of fluids such as water, warm sweet tea : and by the rapid control of bleeding.

The patient is placed in a warm bed under a shock cage, and the foot of the bed is elevated. Morphine $\frac{1}{4}$ gr. is given, and bleeding is controlled. If able to swallow, fluids are allowed, and half a teaspoonful of salt is given with each pint to make good the chloride loss. If swallowing is impossible fluid may be given per rectum or by intravenous drip.

The most important treatment is the administration of blood (in cases of hæmorrhage), dried plasma or serum (where bleeding has not occurred), and in bad cases 3-4 pints may be required. No operation should be considered until the blood pressure has become normal.

ULCERATION.

Describe Ulceration.

Ulceration is the molecular death of the surface cells of a part ; it results from a defective blood-supply. Ulcers may arise from :—

- (a) Trauma ;
- (b) Varicose veins and arterial disease ;
- (c) Trophic disturbances, *e.g.* chronic bed-sores and perforating ulcers ;
- (d) Constitutional diseases, *e.g.* tubercle, syphilis, and scurvy ; and
- (e) Malignant disease.

Because of the superficial area involved infection by pyogenic organisms is almost inevitable.

What points should be noticed in examining an Ulcer ?

- (a) The floor or base. Are granulations present ? Their nature.
- (b) The character of the edges.
- (c) The discharge.
- (d) The condition of the surrounding parts.
- (e) The presence or absence of pain.
- (f) The presence or absence of cicatrisation.

Give the Signs of a Healing Ulcer.

In the treatment of ulcers the surgeon endeavours to bring the ulcer into a “ healing ” condition. The signs of a healing ulcer are :—

- (a) *Base*, smooth and covered by pink firm granulations.
- (b) *Edges*, shelve gradually to the base.
- (c) *Discharge*, slight in amount, and consisting of clear serum.
- (d) *Surrounding parts*, firm and healthy, slightly more vascular than normal.
- (e) *Pain*, absent.
- (f) *Cicatrisation*, all round the edges.

Describe Simple (Non-Specific) Ulceration.

In the acute stage the ulcer is well defined, the edges are inflamed and the base is of a dirty grey colour, and there is a definitely purulent discharge. The area surrounding the ulcer is often swollen and œdematous.

Treatment by the local application of fomentations, followed by weak antiseptic dressings, *e.g.* Eusol, with adequate rest is usually sufficient, and the ulcer then takes on the characteristics of a "healing ulcer."

If treatment is inadequate or because of venous congestion or fixation to the deeper tissues the ulcer may pass into the chronic stage. The appearances are similar to those of varicose ulcer (*vide infra*).

Describe Syphilitic Ulcers.

These ulcers may occur either in the late secondary or tertiary stages. When secondary they are superficial, but when of tertiary origin they usually result from the breaking down of a gumma. A common site is the upper third of the leg. The ulcers are generally multiple, and have a serpiginous outline. The *base* is covered by a yellow "wash-leather" like slough; the *edges* are hard, and have a punched-out appearance; the *discharge* is thick and evil-smelling, consisting of broken-down *debris*; the *surrounding parts* are congested and of a dark-brown colour; *pain* is usually absent; and the *cicatrization* is taking place at one point while the ulcer is spreading at another.

Secondary infection is common and local treatment aims at keeping the area as clean as possible. Anti-syphilitic treatment must be begun at once and should be continued although the ulcer has healed.

What are the Features of Perforating Ulcers?

These ulcers are generally found beneath the head of the first metatarsal bone or under the heel. They follow peripheral neuritis, tabes dorsalis, general paralysis of the insane, or diabetes; in children they are found in association with spina bifida occulta. Perforating ulcers usually form over a septic callosity, and burrow downwards towards

the metatarsal bones and metatarso-phalangeal joints. In appearance they are somewhat circular with a sinus leading from the centre. The sinus possesses an epithelial lining, and is filled with sodden offensive epidermis ; its walls are insensitive. The condition somewhat resembles a tubercular sinus.

In the surgical treatment of a perforating ulcer it is necessary to scrape the epithelial lining thoroughly away, and remove the decomposing epidermis. After this the cavity should be packed.

Describe Tuberculous Ulcers.

Tuberculous ulcers generally follow the breaking down of a tuberculous abscess. The commonest sites are the neck and in the neighbourhood of joints. The *base* is pale and studded with weak granulations which bleed readily ; the *edges* are purplish in colour and undermined, and small tags of skin often bridge over the surface ; the *discharge* is thin, watery, and curdy ; the *surrounding parts* show no signs of induration ; *pain* is absent, and there is no evidence of *cicatrization*.

Give the Treatment.

Treatment is both local and general. The latter comprises fresh air, rest, good feeding, and injections of tuberculin. When the ulcers are small, scraping or excision can be practised ; subsequent skin-grafting may be necessary.

Describe Bazin's Disease.

This condition is generally found in the legs of young females suffering from some form of tuberculosis. Dark, hard nodules, often painful, form on the surface of the limbs, which subsequently break down, leaving small ulcers with undermined margins. The ulcers themselves are painless. It is very difficult to demonstrate the tubercle bacillus in this affection.

Treatment by scraping may be followed by recurrence. General measures for tuberculosis and local excision are of value.

GANGRENE.

What is Gangrene ? How is it Caused ?

Gangrene is death of the soft tissues *en masse*, resulting from an arrest of the blood supply. It can be classified into three types : (a) dry gangrene, in which the arterial supply to the part is arrested, but the venous return is unimpaired ; the affected area is therefore drained of fluid and remains dry ; (b) moist gangrene, which follows the arrest of both arterial and venous circulation ; and (c) infective gangrene.

There are numerous predisposing causes such as debility, diabetes, arterial disease, ergot poisoning, and in some cases gangrene may follow trauma, *e.g.* pressure of splints, the prolonged application of a tourniquet, or extremes of heat or cold as in severe burns and frost-bite.

Describe Dry Gangrene.

The skin becomes dead white in colour and appears waxy and translucent, but within a short period it shrivels and, owing to changes in the blood and tissues, it becomes gradually darker brown and finally black. Pulsation is absent in the peripheral arteries and the limb is cold. At the onset there is often severe pain, but as the nerves lose their vitality there is later complete loss of sensation. If the part remains free from infection there is no associated systemic disturbance.

The gangrenous area spreads slowly until it extends proximally to a level where the circulation is adequate and a line of demarcation is formed between the dead and living tissues. Granulation tissue from the proximal side gradually completes the separation of the gangrenous area, but owing to the deeper tissues and bone having a relatively larger blood supply than the superficial tissues the stump so formed is conical.

Very careful treatment is required to prevent infection.

Describe Moist Gangrene.

This type of gangrene may follow simultaneous occlusion of the arterial and venous supply to a limb. It is more

frequently caused, however, by the occurrence of infection in a limb already devitalised by impaired circulation or it may result from infection in a case of dry gangrene.

The limb usually becomes swollen and the skin mottled reddish-purple or greenish in colour. Blisters are produced by the destruction of tissue and there is no line of demarcation as the lesion spreads too rapidly. Owing to the absorption from the limb of toxic products there is a marked toxæmia.

What is Senile Gangrene ?

Senile gangrene is the name given to a type of dry gangrene occurring in elderly people as the result of arterio-sclerosis. The circulation becomes so limited that even a trivial injury is sufficient to precipitate disaster and typical dry gangrene ensues.

Describe Diabetic Gangrene.

This type of gangrene occurs in diabetics usually over fifty years of age. Changes in the arterial walls of an arterio-sclerotic nature are common in diabetes and neuritis is also frequent. The gangrene is moist in type as the poorly-nourished tissues are so liable to infection and the local lesion aggravates the diabetes. Pain is a feature and treatment should be promptly carried out to stop the absorption and to bring the diabetes again under control. The prognosis is unfavourable.

What is Carbolic Acid Gangrene ?

Weak solutions of carbolic acid when applied to the fingers and toes of women and children are very apt to cause dry gangrene. The carbolic acid destroys the red blood corpuscles (hæmolysis), thrombosis follows, and thus the blood supply is cut off from the part. As the drug is an anæsthetic, the onset of gangrene is painless. The dead part gradually assumes a dark leathery appearance. It separates very slowly.

Describe Cancrum Oris.

Cancrum oris is a virulent form of gangrene which commences as an ulcerative stomatitis. The condition most commonly occurs in weakly children suffering from scarlet fever, measles, or typhoid; a similar form of gangrene known as *noma* may affect the vulva.

The cheek is gradually perforated, the floor of the mouth, and even portions of the jaws may become involved. Marked constitutional reaction takes place, and evil-smelling, blood-stained saliva dribbles from the mouth.

Treatment consists in freely and widely excising the affected tissues. Grafting will be necessary at a later period.

Describe Phagedena.

Phagedena is the name given to acute infective gangrene. The tissues are destroyed, leading to extensive ulceration, and the part is swollen and dark purple in colour. The condition was common in the pre-antiseptic era and is now only seen in the penis following neglected cases of venereal disease.

Enumerate the Circulatory Lesions which may cause Gangrene.

Disease of the arterial wall, *e.g.* arterio-sclerosis, thrombo-angiitis obliterans.

Obstruction of the lumen, *e.g.* embolism, thrombosis.

Pressure from without, *e.g.* prolonged application of tourniquet, plaster too tightly applied.

Chemical, *e.g.* ergot and carbolic.

Vasomotor, *e.g.* Raynaud's disease.

Other causes are acute pyogenic infection, *e.g.* cancrum oris, phagedena and gas gangrene.

Describe Gas Gangrene.

Gas gangrene results from the infection of a wound with anaerobic organisms of the spore-bearing *Clostridium* type. The organisms commonly found are *B. Welchii*, *Vibrio septique*, and the bacillus of malignant œdema. The organisms flourish in dead tissue, particularly muscle, and are often found in the vicinity of a foreign body. They all

produce virulent toxins. Organisms of this type may be found in wounds without gas gangrene occurring, and the term gas gangrene is essentially a clinical one.

The onset of the disease may occur within a few hours of the injury in acute cases, but it may be four days or even longer before signs are apparent.

Muscle is the tissue most frequently affected and the spread of infection is longitudinal. Thus one muscle group is commonly involved and only rarely is the whole circumference of a limb affected.

The symptoms and signs are :—vomiting, rise of temperature except in the later stages of severe toxæmia, pain, increased pulse rate. Locally, at first, there is a small amount of thin discharge containing bubbles of gas, and later there is a distinctive offensive smell. The area is swollen, the skin becomes brown mottled with patches of purple, and crepitation can be felt. X-rays may show the presence of gas in the deeper tissue planes.

What is the Treatment ?

Prophylaxis is the best form of treatment and all wounds seen in the first twenty-four hours should be thoroughly excised and, in cases of doubt, sulphapyridine should be given, three tablets of 0.5 gr. orally, and thereafter one tablet four-hourly. Powdered sulphanilamide or sulphapyridine up to 15 gr. may be applied locally after débridement.

Treatment of the established case.—In cases where gangrene is limited to one muscle group it should be excised, but in more extensive cases amputation will be necessary. The affected muscle is identified by its brick-red colour and loss of contractility.

Polyvalent serum is given intravenously in doses containing at least 7000 units of B. Welchii antitoxin. In addition sulphanilamide or sulphapyridine is administered orally as follows :—four tablets (2 gr.) followed two hours later by two tablets four-hourly for forty-eight hours.

What is the Treatment of other forms of Gangrene ?

This will be discussed in the section on diseases of the blood-vessels.

TUMOURS.

Contrast Benign and Malignant Tumours.

| BENIGN. | MALIGNANT. |
|--|---|
| Usually grow slowly. | Usually grow rapidly. [N.B. Exceptions—Rodent ulcers and atrophic scirrhus.] |
| Encapsulated. | No capsule. |
| No metastasis. | Tendency towards meta- stasis. |
| No constitutional disturb- ance—cachexia. | Often cachexia. |
| No recurrence after complete removal. | Tend to recur. |
| No pain. | Painful. |
| Grow by pushing neighbour- ing tissues aside. | Grow by infiltrating tissues. |

How would you define the Situation of a Tumour?

- (a) It may be attached to the skin.
- (b) In the subcutaneous tissues.
- (c) Attached to the deep fascia, or under it.
- (d) It may be glandular, attached to muscles, nerves, or blood-vessels.

How could you find out these Points?

To see if it is fixed to the skin, try to pinch up the skin OVER it—e.g. a *sebaceous cyst* is attached at *one point*; a *fatty tumour* is attached by little tags in *radiating lines*; a *scirrhus* is attached in a *flat mass*.

If it lies in the subcutaneous tissues, the skin will move over it, and it will move over the deeper structures.

If attached to the deep fascia, make the fascia tense and

try to move the tumour. If under the deep fascia, it will probably be painful when the deep fascia is made tense.

Glandular growths may be recognised by the region where found, and by their shape.

If a part of, or attached to, a *muscle*, throw the muscle into action and feel its edge, and note the relation to and the effect on the tumour.

If attached to vessels and nerves, observe the *position*; presence or absence of pulsation; it will move easily in the transverse direction, but not in the longitudinal. If attached to periosteum and bone, it will not move except with the bone, to which it may also be traced.

Tumours are described under the diseases of systems later.

CYSTS.

Classify Cysts.

Cysts may be congenital or acquired. Congenital cysts are of two kinds:—(a) dermoid cysts; (b) cysts derived from embryonic structures which should normally disappear or become vestigial in the process of development, *e.g.* thyroglossal cysts.

Acquired cysts are further subdivided into: (a) traumatic; (b) retention cysts; (c) parasitic.

How would you Diagnose a Cyst?

By its strict limitation, the absence of lobules, its rounded shape, fluctuation, but without the rim or hard edge of an abscess; if it be a hæmatoma there will be some sign or history of an injury.

What are the Signs of a Cyst?

Cysts are known by their spherical or globular shape, smoothness, strict limitation, fluctuation, and slow growth; by the absence of inflammation, and by their locality.

Describe Dermoid Cysts.

Dermoid cysts are due to the sequestration of cells of the epiblast beneath the surface at a point of developmental fusion. The most common site is at the outer canthus, but they occur chiefly in the mid-line and along the lines of developmental fusion in the face.

The cyst is not fixed to the skin. Treatment is excision.

Describe Hydatid Cysts.

This disease follows the ingestion of the ova of the *tænia echinococcus* which is found in dogs. In the stomach the embryo is set free and passes into the blood-stream. Most of the parasites are held up in the liver, but they may reach other organs. In the tissues the hydatid cyst slowly grows. It consists of two layers, the ectocyst and the endocyst, and also by pressure an outer or false capsule is derived from the tissues of the host. The endocyst is the germinal area and from it grow the brood capsules and scolices. As growth is slow the cyst may reach considerable size and cause symptoms by pressure.

What Complications are liable to Occur ?

- (a) Infection when the cyst becomes an abscess.
- (b) Rupture or leakage of the cyst. Should rupture occur into the peritoneal cavity or a hollow viscus it is usually fatal. Slight leaking of fluid is accompanied by the symptoms of anaphylaxis and the Casoni reaction is positive. The complement-fixation test will also be positive.

What is the Treatment ?

Where possible the cyst should be excised. Failing this it should be marsupialised. The injection of 10 per cent. formalin to destroy the inner wall of the cyst was previously advised.

BURNS AND SCALDS.

Describe Burns.

Burns are caused by the action of dry heat upon the tissue ; scalds through the action of moist heat. Both varieties produce very similar results upon the affected part. Six degrees of severity are recognised :

- 1st. Redness of the skin, erythema.
- 2nd. Blistering or vesication.
- 3rd. Partial destruction of the true skin.
- 4th. Complete destruction of the true skin.
- 5th. Destruction of fasciæ and muscles.
- 6th. Charring of bones.

The second degree heals without any scarring. In the third degree the epithelial cells of the true skin are only partially destroyed. Islets of epithelium rapidly spring up in all directions, and in a short time spread over the surface. When healed a visible scar is left. Little contraction or deformity results. Owing to the sensory nerves of the skin being irritated but not destroyed, burns of this degree are very painful. In the fourth degree there is less pain, because the sensory nerve-endings are destroyed ; greater deformity and contraction occur.

Describe the Clinical Features.

The clinical features of a major burn may conveniently be divided up into stages. In stage one, immediately following the injury, the patient is suffering from primary shock. With adequate treatment stage two supervenes. Here the patient has recovered from the primary shock and local treatment of the burn is carried out.

Stage three is that of acute toxæmia and varies in intensity and may be rapidly fatal or comparatively mild. It is caused by the absorption of toxic substances produced in the damaged area and is shown clinically by rise of pulse respirations and temperature, fall in blood pressure, restlessness, delirium, and often cyanosis. The toxæmia may begin from a few hours to some days after the burn.

Stage four is that of healing and it may be complicated by sepsis and is often prolonged.

What are the Complications of Burns ?

Scarring with consequent deformity and contractures.
Duodenal ulcer.

Describe the Treatment of Burns and Scalds.

Minor burns or scalds are of little consequence and are treated by the application of tannic acid jelly or ointment.

The treatment of more severe cases is better considered in stages.

Stage 1.—Warmth in bed with shock cage. Morphine to allay pain and the administration of fluid. When the shock has been recovered from the local treatment is carried out.

Stage 2.—Local Treatment.—Under gas and oxygen anaesthesia the burnt area is carefully cleansed with normal saline, all the dead raised epidermis being removed. Vigorous scrubbing causes exudation and is not indicated. The part is “tanned” by the application of an aqueous solution of tannic acid. Various strengths are used—from $2\frac{1}{2}\%$ to 20% —by different surgeons. When weak solutions are employed the area must be sprayed with the tannic solution every two hours until a firm coagulum is obtained. The method commonly in use is the combination of tannic acid and silver nitrate. After cleansing 10% tannic acid is applied and after drying with hot air 10% silver nitrate is employed in the same way. Neither of these two solutions is antiseptic and as a rule some lotion such as gentian violet, acriflavine or mercurochrome is applied over the whole extent of the burn.

No dressings are required, the patient is returned to bed and is nursed under a shock cage, no bedclothes being allowed in contact with the tan. Limbs are splinted to prevent the subsequent development of contractures. The tan must be carefully looked after and the edges are the important part. They should be kept dry by the application of ether and gentian violet.

Care must be taken in burns of the hand that the formation of a thick coagulum does not interfere with the circula-

tory and lymphatic return. Œdema may be relieved by elevation of the limb.

Stage 3.—The onset of toxæmia is shown by a rise in the pulse and temperature and treatment must be immediate. Alternate saline and glucose saline is given by intravenous drip, a careful watch being kept for the development of œdema. The restlessness is controlled by sedatives. Recently it has been shown that corticæal extract of the suprarenal has the effect of bringing the blood sodium back to normal limits and it should be given as long as the pulse rate is above normal, *e.g.* per cortin 10 mgm. four-hourly.

Stage 4.—Minor degrees of sepsis are common and any sign of pus forming under the tan is an indication to remove the raised portion. Treatment with sulphanilamide is begun at once.

When the tan separates there may be a large area still to heal, and dressings with vaseline and eucalyptus ointment or cod-liver oil are efficacious. Healing may be slow and in many cases it can be expedited by the use of pinch grafts or Thiersch grafting.

DISEASES OF THE SKIN.

Give the Pathology of a Carbuncle.

A carbuncle is an acute staphylococcal infection of the subcutaneous tissues which terminates in gangrene of the affected parts. It is usually found on the back of the neck or on the gluteal region, and is uncommon before middle age. Chronic alcoholism or diabetes often accompanies the condition.

What are the Clinical Features?

- (a) The usual constitutional symptoms of septic absorption.
- (b) A hard, brawny swelling of the diseased area, with redness and œdema.

- (c) Later on suppurating foci discharging pus, and a central greyish slough. This separates very slowly.
- (d) Very severe pain leading to insomnia.

What is the Treatment ?

The general measures for the treatment of the constitutional symptoms are adopted and the diabetes (if present) controlled.

Locally conservative measures, *e.g.* fomentations with hypertonic saline, magnesium sulphate in glycerine, or elastoplast, may be employed. The patient's own blood may be injected around the carbuncle. Many cases will heal with conservative measures, but if these fail the carbuncle may be excised if the size and site allow or cruciate incisions are made and the flaps raised, the slough removed and a pack inserted.

Describe Keloid.

A keloid is a localised hyperplasia of fibrous tissue occurring in a scar. It forms dense raised patches and the epithelium becomes thinned out over it.

The treatment is by X-ray therapy, for excision is liable to be followed by recurrence.

Describe Sebaceous Cysts.

These swellings are of the nature of retention cysts, and contain broken-down fat cells, epithelial debris, and cholesterol. The wall consists of fibrous tissue lined by stratified epithelium. The most common sites are the scalp, face, shoulders, and scrotum. Note that the skin at one point is adherent to the cyst wall. Sebaceous cysts may remain stationary, slowly enlarge, become inflamed, suppurate, or even calcify.

The cyst should be excised.

Describe Simple Papilloma of the Skin.

Papilloma is the name given to the ordinary wart which may be single or multiple. The tumour has a central core of connective tissue covered by squamous epithelium.

The wart, if pedunculated, may be treated by ligation or it may be cauterised by silver nitrate, CO₂ snow, trichloroacetic acid or diathermy. In cases of multiple warts X-ray is effective.

Describe Rodent Ulcer.

This tumour arises from the basal epithelial cells of the epidermis. The commonest site is in the region of the inner canthus. The condition begins as a hard, raised papule which breaks down in the centre, leaving a definite ulcer. Later, the edges of the ulcer take on a characteristic "rolled-out" appearance. The cancer is only slightly painful, but the patient may complain of itchiness in the part. The lymphatic glands are not involved. The ulcer spreads very slowly, but destroys soft parts and bones equally. The disease is often fatal from intracranial complications.

How does it differ pathologically from Epithelioma?

- (a) Cell-nests are absent.
- (b) The cancer begins below the basement membrane instead of above it.
- (c) No keratinisation in the cells.

Give the Treatment.

In early cases excision is curative, but radium or X-ray therapy is also successful before the lesion has invaded too deeply. Following excision suture may be possible; skin-grafting is required in more extensive cases.

Describe Squamous Epithelioma.

This tumour arises in the skin usually as the result of long-continued irritation, *e.g.* paraffin epithelioma and lupus carcinoma. The tumour may start as a papilloma, but eventually the typical ulcer with sloughing base, raised indurated edges and foul discharge results. At an early stage metastases occur in the regional lymphatic glands.

What is the Treatment ?

In very early cases local excision of the ulcer may be possible, but surgery in all other cases must aim at excision of the tumour and its area of lymphatic drainage.

Radium and X-ray therapy are satisfactory and less mutilating.

Describe Melanoma.

A simple melanoma resembles the ordinary papilloma of the skin, and treatment is only necessary when it is subject to irritation or for cosmetic reasons. The tumour should be excised.

If the tumour suddenly begins to grow larger or ulceration occurs malignant change is likely. The tumour spreads rapidly to the lymphatics and is rapidly fatal in spite of widespread excisions.

What Methods of Skin-Grafting are Employed ?

Four methods of skin grafting are employed :

(a) *Thiersch's method* employs the superficial layer of the skin, the line of section passing through the tips of the papillæ. The graft is laid on the surface of a mould, which is applied to the granulating surface. Care must be taken to make the grafts overlap the edges of the wound and the adjoining grafts.

(b) When whole thickness grafts are required the *pedicle graft* is used, the tube of skin being formed at the first operation and transferred in stages to the raw surface.

(c) The healing of large areas may be expedited by the use of *pinch grafts* (Reverdin's method) which are obtained by lifting up small "pinches" of skin with the point of a needle, cutting them off with a sharp knife and sowing them over the raw surface.

(d) *Cutis vera grafts* from which the epidermis has been scraped off are employed subcutaneously for the repair of large herniæ, the graft being placed in the area and becoming replaced by fibrous tissue.

DISEASES OF BONE.

Describe a Long Bone.

A long bone consists of two expanded ends or epiphyses united by a narrower cylindrical part, the shaft or diaphysis. Before the cessation of growth a strip of cartilage separates the epiphysis from the shaft—the epiphyseal cartilage, from which the growth of the bone in length occurs. The shaft consists of an outer casing of compact bone and the central portion or medullary canal contains spongy bone and yellow bone-marrow. The epiphyses have a thin outer shell of compact bone, and the remainder consists of spongy bone with red bone marrow in its meshes. The blood supply of the diaphysis is derived from the nutrient artery which enters the shaft about its middle and divides into two branches which pass to each end of the bone. Periosteal vessels nourish the superficial part of the shaft and the epiphysis is supplied by the epiphyseal vessels.

The shaft is covered by the periosteum which is firmly attached to the epiphyseal cartilage, and the ends of the epiphyses are covered by articular cartilage where they take part in the formation of joints.

Describe briefly the Chemistry of Bone.

Bone has a very complicated structure and even the exact nature of its inorganic content has not been established. The two most important elements in bone are calcium and phosphorus and there is a constant exchange of these salts between the bone and the blood-stream. This exchange is regulated by a very large number of factors such as the intake of these substances in the diet, adequate vitamin intake and by the action of certain endocrine glands. In addition local factors such as circulatory changes play their part in the laying down or absorption of calcium.

What Factors regulate Calcium Metabolism?

Diet.—There must be an adequate calcium intake, but if this is combined with too large a phosphorus content the calcium will be precipitated and absorption cannot occur.

Vitamin D.—The exact action of this vitamin is obscure, but it appears to render the calcium in the intestine more readily absorbable and also plays a part in the metabolism of calcium.

Phosphatase.—This enzyme is present wherever bone is being laid down and acts by breaking down the complicated organic compounds of phosphorus and setting free the phosphate ions which combine with Ca ions to form the calcium phosphate of bone. The phosphatase in the blood can be estimated and is found to be raised in all generalised disease of bone in which new bone formation is a feature.

Parathyroid Gland.—This gland regulates the level of calcium in the blood. If the parathyroid becomes over-active (hyperparathyroidism) calcium is removed from the bones and there is an increase in the blood calcium and in the excretion of calcium.

Pregnancy.—Additional calcium is required for the needs of the foetus which are normally met by the calcium in the diet. If the calcium input is restricted calcium will be removed from the bones of the mother to satisfy the needs of the foetus.

Define the Chief Terms used in Diseases of Bone.

| | | |
|-------------------|---|---|
| PERIOSTITIS . | . | An inflammation of the periosteum. |
| OSTEOMYELITIS . | . | An inflammation of the bone-marrow. |
| EPIPHYSITIS . | . | An inflammation of the epiphysis. |
| RAREFYING OSTITIS | | An inflammation in which the trabeculae of the bone are absorbed. |
| OSTEOPOROSIS . | . | A spongy condition of the bone resulting from rarefying ostitis. |
| CARIES . | . | Molecular death of a portion of bone. It is analogous to ulceration of soft parts. |
| CARIES SICCA . | . | A caries without suppuration. |
| NECROSIS . | . | Death <i>en masse</i> of a portion of bone. It is analogous to gangrene of soft tissues. The dead area of bone is termed a <i>sequestrum</i> ; when superficial—an <i>exfoliation</i> . |

- SCLEROSIS** . . . A condition in which the bone becomes heavier and denser.
- HYPEROSTOSIS** . . . An increase in the thickness or girth of a bone, owing to an exaggerated formation of new bone by the periosteum.

Describe Atrophy of Bone.

Atrophy of bone occurs in old age due to the negative calcium balance normally present in the later years of life ; it also occurs at any age following disuse resulting from paralysis, long - continued immobilisation, etc., in the absence of any bone disease. It is possibly brought about by the relatively large blood supply in comparison with the want of activity of the part as hyperæmia causes decalcification. Localised atrophy also follows the pressure of tumours or aneurisms and a type following trauma—post-traumatic or Sudeck's atrophy—is described below.

ACUTE OSTEOMYELITIS.

Give the Surgical Pathology of Acute Osteomyelitis.

Acute osteomyelitis generally results from infection by staphylococcus pyogenes aureus, but may follow streptococcal diseases, or even typhoid fever. The organisms reach the bone-marrow *via* the nutrient and the metaphyseal arteries, and lurk in the small vessels of the ossifying junction (the metaphysis). They may remain latent in this region for a considerable time, but whenever the vitality of the bone is lowered, as from trauma, wading in cold water, etc., they begin to multiply. If the disease attacks both extremities of the bone, the term *bipolar osteomyelitis* is used. Pus and granulation tissue are formed, the former travelling along the Haversian canals until the exterior of the bone is reached. The pus lifts up the periosteum for a variable distance, and, owing to the cutting off of the blood supply from the periosteal vessels and the tension within the bone, portions of the shaft

undergo necrosis. In the course of six or seven weeks the dead portion is separated by granulation tissue, and forms a *sequestrum*. Meanwhile, the periosteum is producing a new bony case, the *involucrum*, the latter being perforated here and there by the pus endeavouring to reach the surface. The holes in the involucrum are called *cloacæ*.

What is meant by the term " Acute Arthritis of Infants " ?

A purulent inflammation of the joint occurring in young children, caused by the pus in acute osteomyelitis erupting into the neighbouring joint.

What are the Signs of Acute Osteomyelitis ?

- | | | |
|-------------|---|---|
| (A) GENERAL | { | Usually a rigor, followed by an increase in temperature ; and having morning remissions. Headache and gastro-intestinal disturbance. Cerebral symptoms such as delirium and convulsions often occur. |
| (B) LOCAL | { | Pain and exquisite tenderness of the affected region ; swelling of the bone near the epiphysis is found at a later period. Oedema of the surrounding parts takes place, and subsequently an abscess forms. When the abscess bursts a sinus develops, the discharge from which often contains small fragments of bone, fat droplets, and even blood. |

Give the Differential Diagnosis of Acute Osteomyelitis.

Acute osteomyelitis must be diagnosed from—

- (a) Acute rheumatism.
- (b) Scarlet fever.
- (c) Erysipelas.
- (d) Cellulitis.
- (e) Erythema nodosum.

What is the Treatment of Acute Osteomyelitis ?

The large number of suggested methods of treatment serve to show that no specific or satisfactory method has

yet been found. If operation is not carried out quickly the greater will be the destruction of bone, but in very acutely-ill children it may be advisable to delay operation. At operation satisfactory drainage is secured by drilling the bone, but if a subperiosteal abscess has formed it is often sufficient to open it. The wound is not sutured, but a pack is inserted and plaster applied. The dressing is not changed unless there is no improvement in the patient's condition or the smell becomes unbearable. Uleron and anti-staphylococcal serum have proved disappointing, but sulphanilamide is of value in cases due to the streptococcus.

Later, when large sequestra are present, they may be removed by incising the involucrum and obliterating the resulting cavity as far as possible.

What is Brodie's Abscess ?

A circumscribed abscess of bone occurring usually in young adults. The abscess, usually found near the ossifying junction (the metaphysis), is generally single, and most frequently occurs in the upper end of the tibia, the lower end of the tibia, or the lower end of the femur. During the quiescent period a small cavity is found, lined with an osteogenetic membrane, and surrounded by a zone of condensed and sclerosed bone. The cavity is filled with clear serum. If examined during the active stage, pus is found, and the cavity lined with granulation tissue. The affected bone as a whole is thicker and heavier than normal.

Give the Clinical Features.

Pain is at first vague ; later of a " boring " character. The pain is markedly increased on movement, and presents nocturnal exacerbations. On percussion, tenderness can be demonstrated over the seat of the abscess. The neighbouring joints often develop a hydrops.

In the early stages, both the pain and the hydrops are remittent.

If the abscess penetrates into the joint, an acute arthritis follows.

An X-ray photograph should be taken. The central clear area surrounded by a zone of sclerosis is very characteristic.

What is the Treatment ?

The bone should be opened, and the abscess dealt with in a similar manner to that of a bone cavity in acute osteomyelitis.

TUBERCULOUS DISEASE OF BONE.*In what Manner does Tubercle affect Bones ?*

Tuberculous disease of bone is probably more frequently due to the bovine type of bacillus than to the human type ; hence the ingestion of infected milk and meat constitutes the chief source of the disease. The cervical lymphatic glands are involved first, and the tubercular toxins travel from these by the blood-stream. They cause an endarteritis of the medullary artery which leads to a myxomatous degeneration of the bone-marrow. The organisms themselves reach the bone partly by the medullary artery and partly by the metaphyseal twigs from the circulus vasculosus surrounding each joint. An osteomyelitis or a periostitis follows. Both forms develop slowly, and, as a rule, painlessly. They may not be discovered until a cold abscess appears in the soft tissues. Tubercular disease has a great tendency to attack the adjacent joints.

Describe Tuberculous Periostitis.

This form is most frequently met with in the ribs, sternum, vertebræ, and skull. Granulation tissue forms in the deep layer of the periosteum, this tissue cascates, and subsequently a doughy swelling appears. The pus penetrates the periosteum and discharges on to the surface, leaving a sinus.

What is the Differential Diagnosis ?

In the subperiosteal stage tuberculous periostitis must be distinguished from :—



FIG. 1.—OSTEOMYELITIS OF FEMUR.



FIG. 2.—BRODIE'S ABSCESS
IN THE UPPER END OF
THE TIBIA.



FIG. 3.—EARLY TUBERCULOUS DACTYLITIS.



FIG. 4.—SYPHILITIC PERIOSTITIS OF TIBIA.



FIG. 5.- ANTEROPOSTERIOR VIEW OF THE BONES OF THE LOWER EXTREMITY SHOWING ACTIVE RICKETS.



FIG. 6.—PAGET'S DISEASE OF TIBIA.



FIG. 7.—BENIGN GIANT CELL TUMOUR—
UPPER END OF HUMERUS.

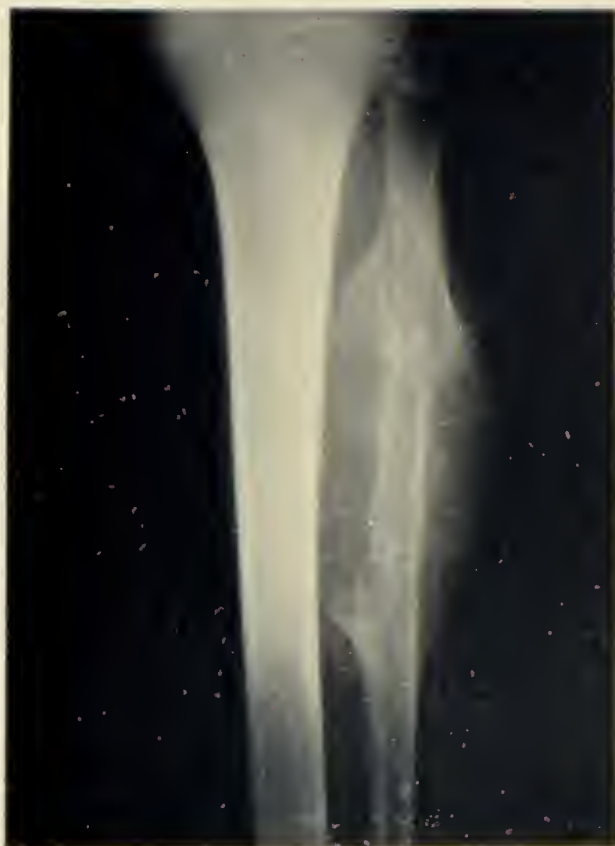


FIG. 8. — OSTEOGENIC SARCOMA.

- (a) Sarcoma. X-ray examination and tuberculin tests are very important.
- (b) Chronic osteomyelitis.
- (c) Parosteal lipoma.
- (d) A gumma.

Give the Treatment.

Constitutional treatment for tuberculosis is strictly carried out. In the case of a lesion in a rib excision of the affected area will hasten recovery. Otherwise surgical treatment is only indicated for abscess formation. Tuberculous disease of the spine is described elsewhere.

Describe Tubercular Osteomyelitis.

This may be either localised or diffuse. In each case the disease results in—

- (a) A rarefaction of the bone from crumbling away of the trabeculæ.
- (b) Endarteritis of all the blood-vessels.
- (c) A fibrosis of the bone-marrow.
- (d) Infection arises usually in the metaphysis and spread to the adjacent joint is common.
- (e) Sequestra are not usually formed and are always of small size.
- (f) New bone formation is unusual, but occurs in the hypertrophic type of tubercle and from secondary infection.

What is Tuberculous Dactylitis?

A diffuse form of osteomyelitis attacking the phalanges, metacarpals, or the metatarsals. When expansion of the bone results, the term *spina ventosa* is sometimes applied. Expansion occurs owing to the formation of new bone by the periosteum. The clinical features are those of a spindle-shaped swelling, which is painless, slowly growing, and only slightly interfering with movement.

What is the Treatment?

The hand is immobilised in plaster or a suitable splint and progress is followed by X-ray examination. Healing occurs

in most cases, but the subsequent growth of the bone may be affected.

SYPHILITIC DISEASE OF BONE.

Give the Pathology of Syphilitic Disease of Bone.

Syphilis may attack the skeleton both in the inherited and acquired varieties. It is more common in the former than in the latter condition. During the early secondary stage an evanescent periostitis may occur, while in the late secondary and tertiary stages, periostitis and osteomyelitis are found. The chief results are syphilitic caries, necrosis, and the formation of periosteal nodes. A node is a localised hyperostosis, resulting from the ossification of a subperiosteal gumma.

Syphilitic sequestra are very dense and heavy, and separate exceedingly slowly.

The bones most commonly affected by syphilis are those of the cranium, nasal, and palate bones, tibia, femur, and phalanges.

Contrast Syphilitic and Tuberculous Diseases of Bone.

| TUBERCLE. | SYPHILIS. |
|---|--|
| Usually attacks the articular extremities. | Syphilis appears in the shafts. |
| Joint complications very common. | Joint complications rare. |
| Mainly a rarefying osteitis, resulting in OSTEOPOROSIS. | Mainly a condensing osteitis, resulting in OSTEOSCLEROSIS. |
| Caries commoner than necrosis. | Necrosis commoner than caries. |

Give the Signs of Syphilis of Bone.

A swelling may be detected, smooth, elastic in the centre, dense round the periphery. A sinus may lead to the surface. Severe "boring" pain often causing insomnia.

What is the Differential Diagnosis?

A gumma must be distinguished from—

- (a) Tubercle.
- (b) Sarcoma.
- (c) Chronic osteomyelitis.

The presence of syphilis may be deduced from the—

- (a) History.
- (b) X-ray examination.
- (c) Positive Wassermann's reaction.
- (d) The improvement following the use of antisyphilitic remedies.

RICKETS.

Describe Rickets.

Rickets is a deficiency disease occurring in young children living in bad surroundings. It is the result of a diet deficient in calcium salts and vitamin D and a want of fresh air and sunlight. The main pathological features are :—

- (a) The epiphyseal cartilage grows irregularly and becomes increased in thickness. Ossification is retarded and cells from the epiphysis extend into the metaphysis.
- (b) The newly formed bone in the metaphysis is soft and poorly calcified and the metaphysis becomes splayed out.
- (c) There is osteoporosis of the long bones and in the skull the ossification of the membranous bones is delayed.
- (d) Owing to the softening of the bone deformity occurs with weight-bearing and later the cortex along

the concave side of the deformed bone hypertrophies.

The typical signs of rickets are :—

- (a) Late closure of the fontanelles.
- (b) Square head, with areas of craniotabes and bosses.
- (c) Irregularity of the mouth and teeth.
- (d) Beading at the costo-chondral junction, the rickety “rosary.”
- (e) “Pigeon-breast” thorax.
- (f) Harrison’s sulcus.
- (g) Enlargement of the abdomen.
- (h) Shortening and curving of the bones of the extremities.
- (i) Perspiration, especially of the head.
- (j) Diarrhœa, the stools being of a greenish colour, and having an offensive colour.
- (k) Marked restlessness as the patient lies in bed.
- (l) Tendency to bronchial and pulmonary troubles.
- (m) Flabbiness of the muscles.
- (n) X-ray shows the wide irregular epiphyseal cartilage and the splaying out of the metaphysis which shows irregular and general impairment of calcification. Deformities may be visible.

What is the Treatment ?

In the acute stage of active rickets the child must be placed in good surroundings, and a diet rich in fresh foods and milk is given. Pain is relieved by splinting the limbs and deformity is prevented. Vitamin D may be given as cod-liver oil or other preparation, and in addition artificial sunlight may be a further source of the vitamin. No active treatment of the deformities need be considered until healing is complete. Healing is shown by the clear-cut outline of the epiphyses and the normal outline and calcification of the metaphyses on X-ray examination. The deformity in most cases is corrected by the growth of the bone and it is only in severe cases that surgical measures are required. The bone may be broken subcutaneously by means of an osteoclast and the deformity corrected or an osteotomy may be performed.

Describe Scurvy.

Scurvy is a deficiency disease which is due to a lack of vitamin C. It occurs in children under two years of age who have been reared upon proprietary foods. The child is listless and markedly anæmic for a time. Hæmorrhages occur in the skin, conjunctiva, from the gums, and beneath the periosteum, especially of the femur. Hyperostosis occurs at the site of these subperiosteal hæmorrhages.

What is the Treatment ?

Scurvy is prevented by the addition of fresh fruit juice to the diet. Treatment of the established condition is equally effective, but the pain of subperiosteal hæmorrhages may require splinting for its relief.

Describe Renal Rickets.

This is a type of dwarfism associated with deformity of the limbs due to impairment of kidney function in young children. The lesion in the kidney may be chronic interstitial nephritis or congenital cystic disease. The signs are polyuria, deformity, radiological widening of the epiphyseal cartilage and the non-protein nitrogen in the blood is increased. No treatment is possible except to splint the affected limbs or to provide a support to allow walking as the disease proceeds steadily to death at an early age from renal failure.

Describe Osteomalacia.

This disease occurs during pregnancy and is apparently due to a failure to absorb calcium. The bones are drained of their calcium and become so softened that gross deformities occur.

MISCELLANEOUS DISEASES OF BONE.

Describe Hypertrophic Pulmonary Osteo-arthritis.

An enlargement of the lower parts of the legs and arms following chronic lung disease. A serous effusion occurs

into the ankle and wrist joints. The deformity is symmetrical and eminently characteristic. The fingers resemble drum sticks ; the thumb, the tongue of a bell ; and the nails are curved like a parrot's beak.

Describe Acromegaly.

This disease results from an enlargement of the anterior lobe of the pituitary (hypophysis cerebri), either from hypertrophy or a neoplasm. A trabecular atrophy occurs in the bodies of the vertebræ, the bones of the carpus and tarsus, and in the angle of the lower jaw. In these bones also a subperiosteal deposit of new bone is found. The lower jaw is elongated and its angle widened. The soft parts of the nose, lips, tongue, hands, and feet hypertrophy. Additional clinical features are violent headaches and optic atrophy due to pressure on the optic chiasma. No treatment is possible.

Describe Fragilitas Ossium.

Fragilitas ossium or osteogenesis imperfecta is a congenital bone disease, often hereditary, where imperfect formation of bone occurs in intra-uterine life. Defective ossification is usually found in the vertex of the skull and in many cases the sclerotics are blue. The bones are readily broken by trivial violence and fractures may be present at birth or may occur during it. Multiple fractures which unite slowly and deformity are the clinical features. The strength of the bones seems to increase as the child grows older. The only treatment is that of the fractures.

Describe Achondroplasia.

A disease occurring in utero during the third to the sixth months. It is a disturbance of the normal process of ossification of the primary cartilage of the epiphyses, the long bones are therefore chiefly affected, being shortened and thickened. The bones of the cranial base are also involved, resulting in a high cranial vault and a recession of the root of the nose. The trunk is of normal length. The condition has to be distinguished from adult cretinism.

No treatment is possible.

Describe Osteitis Deformans.

Paget's disease of bone or osteitis deformans occurs in those over fifty and is more common in males than females. The etiology is unknown. The chief pathological changes are: the bone-marrow becomes highly vascular and the bone undergoes rarefaction and becomes softened so that deformity may occur. Later an excess of new bone is formed, both on the surface and in the medullary canal. Patches of sclerosis appear and the medullary canal may be obliterated. During the first stage there may be a slight increase in the blood calcium, but in the second phase there is an increase in the phosphatase because of the new bone formation and the calcium is normal. The changes are most marked in the skull and pelvis. In the skull the texture of the bone is altered, the diploe disappears and the sutures are obliterated.

Clinically there may be only vague pains in the limbs, but in the later stages there may be enlargement of the head, kyphosis, the head is bent forwards, the legs are bowed, and the arms appear excessively long. X-rays show the irregular outline of the outer table of the skull and the loss of the diploe and the medullary canal in the long bones, the cortex of which is thickened. Sarcoma may be a sequel. There is no treatment to limit the disease, but pain may be relieved by sedatives or X-rays.

Describe Osteitis Fibrosa Cystica.

This disease occurs in two forms: (a) in which a single bone is affected; and (b) generalised type. The bone-marrow becomes vascular and the cancellous bone atrophies and is replaced by fibrous tissue and cysts are frequent. A characteristic feature is the presence of large numbers of multi-nucleated giant cells which are often found in the tissue lining the cysts.

The localised type occurs usually in children, the bone most often involved being the humerus. The first symptom may be a spontaneous fracture. The condition is diagnosed by X-rays which show a clear cyst with thinning of the cortex and no subperiosteal reaction. Often the healing of the fracture results in obliteration of the cyst, but it may be necessary to open the bone and curette the cyst.

The generalised type is rare and is the result of increased activity of the parathyroid glands from hypertrophy or from the presence of an adenoma. The blood calcium is increased and the urinary excretion of calcium greatly in excess. There is some increase in the urinary output of phosphorus and the serum phosphatase is also raised. Treatment is to explore the neck and remove a parathyroid adenoma if present. If fractures occur there is no delay in union.

Describe Osteochondritis.

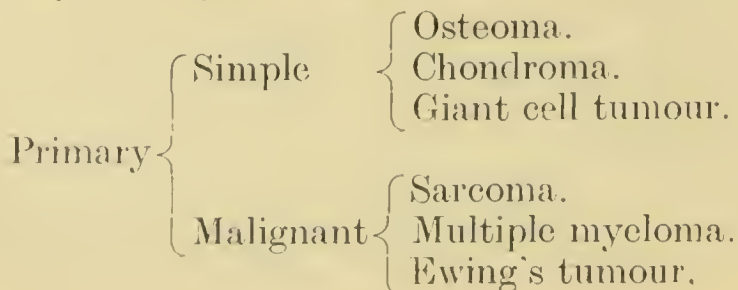
Osteochondritis is the name given to a disease of unknown etiology which attacks the epiphyses of growing bones. It is characterised by symptoms of a minor nature—pain, some limitation of movement in the adjacent joint. The pathology is unknown, but the X-ray changes are diagnostic. The epiphysis initially shows a slight decrease in density and very quickly takes on a fragmented appearance, islands of sclerosis alternating with areas of rarefaction. The affected bone is softened and, if weight-bearing is allowed in lower limb lesions, deformity occurs.

Different names have been given to the disease in different sites, *e.g.* Perthes' disease of the hip, Köhler's disease of the tarsal scaphoid, and Osgood-Schlatter's disease of the tibial tuberosity.

Healing occurs and should be encouraged to take place without deformity by cessation of weight-bearing and the application of splints or plaster.

Classify Tumours of Bone.

Tumours of bone may be primary, arising in the bone or secondary from metastasis of a tumour elsewhere. Primary tumours may be simple or malignant.



Secondary deposits in bone follow malignant disease in the kidney, breast, thyroid, uterus, and prostate most frequently. They may cause severe pain, but the first sign in some cases is a pathological fracture. The X-ray appearances are those of destruction of the bone with no apparent reaction of the surrounding normal tissue. The treatment is symptomatic.

Describe Osteoma.

This simple tumour of bone exists in two forms : (a) the cancellous osteoma ; and (b) the ivory osteoma. The cancellous type is that often referred to as an exostosis and is found growing from the epiphyseal area of a long bone. It forms a miniature long bone and is covered by a cap of cartilage. It grows slowly and, as the parent bone increases in length, it comes to lie nearer its centre. The tumour is symptomless until complications occur, *e.g.* a bursa may develop over it or tendons may catch on it or it may be fractured. Treatment is only required when complications arise.

The ivory type arise from the flat bones of the skull, sometimes from the inner table. They are avascular and are covered only by the periosteum. They also occur on the bones of the face, pelvis, and scapula, and in the orbit. Treatment is only required if they are causing symptoms and is excision of the tumour.

Describe Multiple Exostoses.

This is a familial disease characterised by the development of multiple osteomata from the ends of the long bones, especially the lower end of the femur and upper end of the tibia. In addition there is a failure of modelling of the bone ends and the metaphyses are irregularly broadened. The disease is also known as metaphyseal aclasis. The only possible treatment is the removal of exostoses which are causing symptoms by pressure on tendons or nerves.

Describe Chondromata.

A chondroma is a simple tumour composed of cartilage cells arranged irregularly and varying in size. The tumour has a fibrous capsule. Two varieties are described.

Chondroma may take the form of a single tumour growing from the diaphysis of a long bone or it may also have its origin in one of the flat bones. It grows slowly, eroding the bone and often showing areas of calcification. Symptoms are usually absent until it reaches a considerable size or complications ensue. The complication to be feared is malignant change. Radiologically there is a soft tissue tumour with some erosion of the bone often showing patchy calcification. There is no apparent reaction to the tumour. The tumour should be excised.

Multiple chondromata occur in the short long bones of the hand where they grow slowly in the inside of the bone and gradually expand it. Later, deformity occurs from the irregular growth. The tumours may regress about puberty. Treatment is curettage.

Describe Giant Cell Tumour.

This tumour is most frequently found in the neighbourhood of the knee joint, growing in the lower end of the femur, or in the upper end of the tibia. Other common sites are the upper part of the humerus and the lower end of the radius. The tumour expands the bone gradually, the cortex becoming greatly thinned out but the articular cartilage remains intact. The contents are chocolate-coloured and there is a tendency towards cyst formation. The characteristic histological feature is the presence of multinucleated giant cells. Metastases have been described and, although this is uncommon, it must be regarded as a border-line tumour.

Symptoms are usually absent and the diagnosis depends on X-rays which show the great expansion of the bone with the thinned-out cortex and the substance of the tumour is divided up by trabeculae.

Treatment depends on the size of the tumour. Small tumours are curetted and larger ones require the removal of the affected area of the bone and grafting.

Describe Osteogenic Sarcoma.

This tumour occurs in young subjects and is most frequently found in the lower end of the femur and the upper

end of the tibia. It arises in the metaphyseal area of the bone either close to the periosteum or in the interior of the bone. The tumour spreads rapidly, but is limited by the epiphyseal cartilage and the periosteum. The periosteum is raised from the bone and at its upper and lower limits bone may be laid down parallel to the shaft (Codman's triangle), whereas in the central area it tends to be at right angles to the shaft (sun-ray appearance). The cortex of the bone is quickly destroyed. Local spread of the tumour also occurs along the medullary canal. Metastases occur early in the lungs.

Clinically pain is the first symptom and later a swelling may become visible. X-rays show the destruction of the bone, the raised periosteum and no sharp definition of the outline of the tumour.

Treatment is unsatisfactory, but amputation well above the tumour, X-ray therapy, and treatment by Coley's fluid are all employed.

Describe Ewing's Tumour.

This tumour occurs in young subjects and is rare after thirty. The course of the disease simulates that of osteomyelitis with attacks of pain and fever with tenderness and thickening of the bone. Bone destruction and the laying down of layers of bone occur seriatim so that the appearance has been aptly likened to an onion. The tumour is so soft that on exploration it may be mistaken for pus. Histologically it resembles a round cell sarcoma. Metastases occur and the prognosis is bad, although the tumour responds to X-ray therapy.

Describe Multiple Myeloma.

A rare disease mainly affecting men over forty years of age. It is a primary new formation attacking the medulla and cancellous tissue of bones of the cranium and trunk; the limb bones are less frequently affected. Histologically, the neoplasm consists of nucleated round cells closely resembling marrow cells. The leading clinical features of the disease are :—

- (a) Local absorption of bones.
- (b) An absence of metastases.
- (c) Severe neuralgic pains.
- (d) Intermittent fever.
- (e) Progressive wasting ; and
- (f) The appearance of Bence-Jones' albumose in the urine in less than half of the cases.

Solitary tumours of the plasma cell myeloma type have been recorded in long bones and are only locally malignant.

The response to radiation is dramatic, but recurrence is inevitable.

NERVES.

Classify the different Fibres in the Peripheral Nerves.

(a) Those of *deep sensibility* ; they transmit pressure impulses. When motor nerves and *tendons* are severed, deep sensibility is lost.

(b) Those of *protopathic* sensibility, *i.e.* the fibres conducting painful and thermal impulses.

(c) Those of *epicritic* sensibility ; they conduct tactile and fine thermal impulses.

How would you test the Sensory Phenomena following Injury or Division of a Nerve ?

Screen the patient's eyes during the examination.

EPICRITIC.—(a) Stroke the skin gently with a piece of cotton wool.

(b) With a pair of blunt-pointed compasses see if the patient can distinguish the two separate points.

PROTOPATHIC.—(a) *Thermal*—test-tubes containing hot or cold water.

(b) *Pain*—By a sharp needle.

DEEP SENSIBILITY.—By pressing with a lead-pencil, etc.

Enumerate the Phenomena following the Complete Division of a Mixed Nerve.

- (A) SENSORY. { (a) Absence of protopathic sensibility.
 (b) Absence of epicritic sensibility.
- (B) TROPHIC. { (a) Dry skin.
 (b) Brittle and furrowed nails.
 (c) Perforating ulcers may form.
- (C) VASO-MOTOR. { (a) At first the local temperature is
 elevated ; but afterwards it falls,
 and the limb becomes cold.
 (b) Pallor ; bluish appearance in winter.
- (D) MOTOR. { (a) Paralysis of muscles supplied by the
 severed nerve.
 (b) Marked atrophy of these muscles.
 (c) Reaction of degeneration for a time ;
 later no response to electrical
 stimulation.
 (d) Atrophied muscles may be replaced
 by fibrous tissue, the contraction
 of the latter causing deformities.

Describe the Regeneration of a Peripheral Nerve.

(a) When the cut ends are in apposition and sepsis is absent, the axis cylinders of the central end grow peripherally into the degenerated nerve sheath of the distal end. Later, a new myelin sheath forms around the growing nerve. (b) If the ends are not in contact, the new axis cylinders ramify and form a bulbous swelling (neuroma). The distal part shrinks into a fibrous cord.

What is Tinel's Sign ?

Tinel's sign is elicited by tapping on the proximal side of a recently divided nerve. The patient feels a tingling sensation down the limb. It proves that regeneration of new axis-cylinders has commenced, and as these grow distally, the sign can be demonstrated by tapping at lower

levels of the limb. It usually commences about twenty-one days after suture, and ceases when the nerve is completely repaired.

INJURIES OF NERVES.

Describe Erb-Duchenne Paralysis.

In Erb-Duchenne paralysis the anterior primary division of the fifth and often the sixth cervical nerves have been injured. The nerves may be completely or incompletely divided, or hæmorrhages may take place between the nerves and their sheaths. Overtraction of the head during birth, or violent separation of head and shoulder may cause the condition. Soon after the injury tenderness in the supraclavicular triangle is noticed. The muscles usually affected are the deltoid, supra- and infraspinatus, biceps, brachialis anticus, supinator longus, and supinator brevis. There is inability to abduct the shoulder, flex the elbow, and supinate the forearm.

The arm takes up a characteristic position, hanging by the side of the body with the elbow extended and the shoulder internally rotated so that the palm of the hand faces backwards and the fingers are flexed.

What is the Treatment ?

The arm is placed in a splint with the paralysed muscles in a position of relaxation, *i.e.* shoulder abducted to 90° and externally rotated, elbow flexed to 90° , and forearm fully supinated with the wrist dorsiflexed. Recovery in many cases is complete, but if satisfactory movement is not regained operative repair is unlikely to give a better result.

Give the Features of Klumpke's Paralysis.

This type of paralysis follows injury to the lower trunk of the brachial plexus, especially the first thoracic nerve. It may occur from the pressure of a cervical rib. The

intrinsic muscles of the hand are rendered useless, and subsequently the main-en-griffe deformity may follow. Anæsthesia is found over the inner side of the forearm and hand.

What does the Radial Nerve Supply ?

The nerve is derived from the anterior primary divisions of the fifth, sixth, seventh, and eighth cervicals. It supplies :—

SKIN.—Outer side of upper arm from deltoid insertion to elbow, and outer side of back of forearm. The radial branch innervates the ulnar side of the thumb, the radial aspect of the index finger, the contiguous sides of the index and middle fingers, and the adjacent sides of the middle and ring fingers, as far as the first inter-phalangeal joints.

JOINTS.—Elbow and superior radio-ulnar. The posterior interosseous branch supplies the inferior radio-ulnar, radio-carpal, carpal, and the carpo-metacarpals of fingers.

MUSCLES.—Triceps, anconeus, part of brachialis, supinator, and extensor carpi radialis longus. The posterior interosseous supplies all the muscles on posterior aspect of forearm which are not innervated by the radial.

Describe Injury of the Radial Nerve.

The nerve may be damaged by the pressure of the pad of a crutch (crutch palsy); this condition cuts off the motor supply to the triceps, and accordingly the elbow is flexed. Fractures of the shaft of the humerus may be followed by paralysis of the muscles supplied by the nerve and its posterior interosseous branch. This may occur at the time of accident, the nerve being torn by one of the sharp fragments of the bone, or at a later period when the nerve becomes included in, or compressed by, the callus which is formed between the broken ends.

Give the Clinical Features.

Extension of the wrist is impossible (drop-wrist). There remains, however, a slight power of extending the interphalangeal joints of the fingers, as this function is produced by the interossei. The power of supination is greatly diminished, owing to paralysis of the supinator muscles; it is not entirely lost as the action of the biceps remains unaltered. It is important to remember that the triceps and brachialis are not seriously involved, as the former is mainly innervated by branches which are given off from the nerve before it enters the radial groove, and the latter has an additional supply from the musculo-cutaneous. When the radial is severed above the origin of its lateral cutaneous branch, there is impairment of sensation on the dorsum of the hand.

What is the Treatment ?

In crutch paralysis a palmar splint is applied to the hand and forearm; the hand is dorsiflexed to almost a right angle. When the nerve has been seriously damaged in fracture of the humerus, the nerve should be exposed and sutured. In permanent paralysis, Jones' operation can be performed, the tendons of the flexor carpi ulnaris, and flexor carpi radialis being transplanted into the paralysed extensors of the thumb and fingers, and the pronator radii teres into the extensor carpi radialis longus and brevis.

What does the Median Nerve Supply ?

The origin of the median nerve is from the sixth, seventh and eighth cervicals and the first thoracic. It supplies :—

SKIN.—Central part of palm, palmar aspect of outer three and a half digits, and dorsal surfaces of index, middle, and outer half of ring finger, beyond the first interphalangeal joints.

JOINTS.—Elbow, radio-carpal, carpal, all joints of thumb, and interphalangeal of digits except the little finger. The anterior interosseous supplies the inferior radio-ulnar joint.

MUSCLES.—Superficial flexors on anterior aspect of forearm, except the flexor carpi ulnaris; abductor, opponens, and superficial part of flexor brevis of thumb; outer two lumbricals. The anterior interosseous supplies the flexor longus pollicis, pronator quadratus, and outer half of flexor profundus digitorum.

Describe Injury of the Median Nerve.

This nerve is usually damaged in cuts on the anterior aspect of the wrist, or from the broken fragments in Colles' or chauffeur's fracture. The muscles of the thenar eminence, *i.e.* the abductor, opponens, and superficial head of the flexor brevis pollicis, and the two outer lumbricales are paralysed. Note that a certain amount of abduction of the thumb can still be performed by the extensors of the thumb, and a moderate degree of opposition by the flexor longus pollicis. There is anæsthesia over the area supplied by the nerve (*see* previous question) but no loss of deep sensibility unless the tendons have been also severed.

What does the Ulnar Nerve Supply?

The ulnar nerve is derived from the eighth cervical and the first thoracic nerves. It supplies:—

SKIN.—Hypothenar eminence, and inner one and a half fingers on their palmar and dorsal surfaces.

JOINTS.—Elbow, radio-carpal, carpal, carpo-metacarpals of fingers, metacarpo-phalangeal of fingers, and interphalangeal of inner two digits.

MUSCLES.—Flexor carpi ulnaris, inner half of flexor profundus digitorum, inner two lumbricales, all interossei, abductors of thumb, palmaris brevis, abductor, flexor brevis, and opponens of little finger.

Describe Injury of the Ulnar Nerve.

The ulnar nerve may be damaged by wounds on the front of the wrist, or by injuries in the region of the elbow. In the former case the flexor tendons are generally divided as

well, but the dorsal cutaneous branch of the nerve may escape. After complete division, a claw-hand deformity results. The ring and little fingers are dorsiflexed at the metacarpo-phalangeal joints, and palmar flexed at the first interphalangeal joints. The abductors and adductors of the fingers are paralysed, likewise the thumb adductors. The hypothenar eminence and the interossei become atrophied. Remember that the first dorsal interosseous may not be interfered with as it is frequently supplied through the inner head of the median. The sensory disturbance corresponds to the area innervated by the ulnar.

Ulnar neuritis may also follow injuries in the region of the medial epicondyle or a gradually developing cubitus valgus deformity. In these cases the nerve is exposed at the elbow and transposed in front of the epicondyle.

What does the Axillary Nerve Supply? Describe Injury of it.

The nerve supplies skin over the deltoid muscle, the deltoid and teres minor muscles.

It is injured in dislocations of the shoulder joint by fractures of the surgical neck of the humerus or by pressure through the axilla.

The deltoid is wasted and abduction of the shoulder is impossible. The arm should be placed in an abduction frame and galvanism and faradism to the deltoid given.

What does the Lateral Popliteal Nerve Supply?

The lateral popliteal (common peroneal) is derived from the last two lumbar and first two sacral nerves. It supplies :—

SKIN.—Lower third of back of leg together with the outer aspect of the foot and little toe. Through its terminal branches, the outer aspect of the lower third of the leg, dorsum of foot, and dorsal aspect of the toes, excluding the terminal phalanges.

JOINTS.—Knee, ankle, and tarsal joints.

MUSCLES.—By means of the musculo-cutaneous, the peroneus longus and brevis. Through the anterior

tibial, the extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus, tibialis anterior, and peroneus tertius. Accordingly, all the evertors and also the dorsiflexors are supplied by means of the lateral popliteal.

How may the Lateral Popliteal be Injured ?

The outer part of the great sciatic may be damaged, or the lateral popliteal torn in fractures of the neck of the fibula. It has been severed in scythe wounds around the knee. Clinically the leading feature is "drop-foot." Later on in untreated cases, talipes equino-varus results.

What does the Medial Popliteal Nerve Supply ?

The medial popliteal (tibial) takes origin from the last two lumbar and first three sacral nerves. It supplies :—

SKIN.—Through its plantar branches—the heel, sole of foot, and on the dorsum, the nails.

JOINTS.—Knee, tarsal, and metatarsal.

MUSCLES.—Gastrocnemius, soleus, plantaris, and popliteus. Through the posterior tibial, the tibialis posterior, flexor digitorum longus, and flexor hallucis longus. By means of its plantar branches, the intrinsic muscles of the sole, including the interossei.

Describe Injury of the Medial Popliteal.

The medial popliteal is rarely injured. It may, however, be damaged by the pressure of a popliteal aneurysm or of a sarcoma of the lower end of the femur. Dorsiflexion of the ankle may result, and later on a talipes calcaneo valgus deformity. The nerve can be reached by a vertical incision in the middle of the popliteal space.

Describe Neuralgia.

Neuralgia is the term applied to pain along the course of a sensory nerve. It may result from irritation due to pressure on the nerve, from toxic causes or from no obvious

reason. The pain comes on in paroxysms and there is hyperæsthesia of the area supplied by the nerve.

Treatment.—Eliminate focal sepsis, maintain the general health, apply warmth locally, improve muscle tone and prevent deformity. If the cause is not found local treatment by alcohol injection, division or stretching of the nerve may be necessary.

What is Causalgia ?

Causalgia results from the incomplete division of a nerve and is also found in amputation stumps. Most frequently it follows injury of the median nerve and is characterised by intense paroxysms of burning pain in the area supplied by the nerve. Trophic changes are present, the skin being glazed, and sweating is profuse. The pain follows mild stimuli such as a light touch.

Treatment by simple local measures is of no avail. Partially severed nerves may require suture and sympathectomy is sometimes successful, but the actual cause is not known.

Classify Tumours of Nerves.

| | | | | | | | | |
|----------|-------------------------------------|---|------------|-----------|--------------------------------------|---|--|--|
| TRUE. | { Ganglioneuroma. Neuroblastoma. | | | | | | | |
| | { Localised. | { Simple—neurinoma. Malignant—sarcoma. | | | | | | |
| { FALSE. | | | { Diffuse. | { Simple. | { Lesions of neuro- fibromatosis. | { Multiple neuro- fibromata. Cutaneous neurofibromata. Plexiform neuroma Elephantiasis neuromatosa. | | |
| | { Malignant. | { Secondary malignant change in the simple type. | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Describe Acute Anterior Poliomyelitis.

Infantile paralysis is an infectious disease due to a filter-passing virus which is endemic but may occur in epidemic form. The portal of entry is the naso-pharynx and the virus passes from there to the brain and spinal cord. The virus has a selective action on the cells of the anterior horn

of the spinal cord. The disease can conveniently be divided into three stages although all the stages need not be found in one case.

- (1) Acute stage, with constitutional disturbance and paralysis.
- (2) Stage of recovery from the paralysis.
- (3) Stage of residual paralysis.

Stage 1.—The onset is sudden with pyrexia and toxæmia. Depending on the site of the infection there may be meningeal, upper or lower limb, thoracic or abdominal symptoms. Headache, vomiting, drowsiness, neck rigidity and Kernig's sign are present in meningeal cases. Hyperæsthesia, tenderness and weakness of muscle followed by flaccid paralysis are the signs in the limbs.

The paralysis may extend during the first week.

Lumbar puncture shows slightly increased pressure but the fluid to the naked eye appears normal. The cell count is raised, the cells being polymorphs.

Stage 2.—As a proportion of the paralysis is the result of pressure on the cells of the anterior horn by inflammatory œdema, recovery is possible and may continue for two years or more.

Stage 3.—The limb shows wasting of muscle, the paralysis is of the flaccid type and may be limited to one muscle or one muscle group. The skin feels cold to the touch and may show trophic changes. Deformity and shortening are frequently seen.

What is the Treatment?

Stage 1.—Isolation, convalescent serum, and lumbar puncture to relieve tension. Splint the paralysed muscles in the position of relaxation. Hexamine is of doubtful value.

Stage 2.—Splints to prevent stretching of the paralysed muscles and deformity. Massage and electrical stimulation must never cause fatigue to be of value.

Stage 3.—Correction of deformity and stabilisation of flail joints are the main indications for treatment. In some cases the action of a paralysed muscle may be replaced by

the transplantation of tendons. Stability may be secured by the fitting of ambulant splints or by arthrodesis. Sympathectomy has been advised for cases with severe trophic disturbance.

Contrast Infantile Paralysis and Spastic Cerebral Paralysis.

| | INFANTILE PARALYSIS. | SPASTIC PARALYSIS. |
|------------------------------|-----------------------------------|--|
| ETIOLOGY . | Anterior poliomyelitis acuta. | Injuries to brain, or meningeal hæmorrhage. |
| APPEARANCE OF LIMB . | Flaccid, cold, bluish, powerless. | Rigid, often spasms, warm, normal in colour, powerful. |
| REFLEXES . | Lost. | Exaggerated. |
| REACTION OF DEGENERATION . . | For a time. | <i>Nil.</i> |
| ATROPHY . | Marked. | Slight, from disuse. |
| TROPHIC CHANGES . | Readily ulcerates. | <i>Nil.</i> |
| ATHETOSIS . | <i>Nil.</i> | Often. |

CATECHISM SERIES

SURGERY

PART II

FIFTH EDITION

REVISED AND REWRITTEN

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SURGERY

PART II

FRACTURES AND DISLOCATIONS.

Enumerate the Types of Fracture that occur.

(a) *Traumatic* : which occur as the result of violence applied to a normal bone.

(b) *Pathological* : which follow even trivial violence in a bone weakened by localised disease, *e.g.* bone cysts and tumours or as the result of generalised bone disease, *e.g.* osteogenesis imperfecta.

Fractures are also classified into two main varieties of great importance as their treatment is completely different : *simple fractures and compound fractures.*

Simple fracture is a subcutaneous break, *i.e.* without a wound of the soft parts communicating with the exterior.

Compound fracture is the term employed when the fracture communicates with the exterior through a wound of the skin or mucous membrane.

Each of the above varieties may be further classified :—

- (1) Incomplete (greenstick).
- (2) Complete.
- (3) Comminuted.
- (4) Impacted.
- (5) Complicated.

Other terms describing the line of fracture, *viz.* transverse, spiral, oblique and vertical, are self-explanatory.

What is a Greenstick Fracture ?

This type of incomplete fracture occurs in children and is often seen in rickets. The bone bends like a green twig, but although there may be gross deformity the fracture

remains incomplete. Manipulation to reduce the deformity frequently converts the fracture into a complete one.

Explain the Term "Complicated" Fracture.

A complicated fracture is one in which the fracture is associated with some other injury, *e.g.* dislocation of the near-by joint, rupture of arteries, veins or nerves, and injuries to underlying viscera such as the lungs and brain. Two of the most frequent complications are (a) rupture of the urethra in fracture of the pelvis, and (b) damage to the lungs in fracture of the ribs.

Describe Comminuted and Impacted Fractures.

A comminuted fracture is one in which the bone is broken into a number of pieces.

An impacted fracture is one in which one fragment is driven into the other so that the injury may be missed in a cursory examination. Two very common sites are (a) the lower end of the radius, (b) the base of the neck of the femur.

What is a Diastasis?

Diastasis is the term given to the traumatic separation of an epiphysis. It is only possible in the young subject before union of the epiphysis has occurred. The line of separation passes through the metaphysis so that the epiphyseal cartilage remains attached and is displaced with the epiphysis.

Mention the Clinical Features.

- (a) Pain in the region of the epiphysis.
- (b) Swelling with tenderness over the line of the epiphysis.
- (c) Loss of function of the neighbouring joint.
- (d) Unnatural mobility.
- (e) Deformity.
- (f) A muffled type of crepitus.
- (g) X-ray shows the separated epiphysis and the absence of fracture or dislocation in uncomplicated cases.

What are the Causes of Traumatic Fracture?

Fractures of this type are the result of violence applied to the bone in three different ways :

- (a) *Direct violence.* The bone breaks at the point of impact and the line of fracture is usually transverse. In the case of fracture of both bones of the forearm or leg the bones are broken at the same level.
- (b) *Indirect violence.* The force is usually a torsion or shearing strain transmitted along the limb from the site of impact and the bone breaks at its weakest part and the line of fracture is oblique. In the case of fracture of the leg and forearm bones the line of fracture differs in the two bones.
- (c) *Muscular action.* Opinions differ regarding the possibility of bones being broken by the unaided action of muscles, but in sites in which a muscle is acting at a great mechanical advantage it is possible and transverse fracture of the patella is an example of this type of injury.

What are the Clinical Features of a Fracture?

- (a) The history of injury.
- (b) Pain.
- (c) Loss of power.
- (d) Alteration in the contour of the limb due to swelling.
- (e) Deformity.
- (f) Abnormal mobility.
- (g) Crepitus :—the name given to the grating sensation felt and heard when the ends of the broken bone are moved one on the other. It is not necessary or advisable to seek for this sign of fracture.

(h) The X-ray will show the exact state of affairs and in all cases of fracture this examination must be carried out.

How would you Examine a case of Supposed Fracture?

- (a) Hear what the patient or his attendants have to say.
 - (b) Inspect the injured limb
 - (c) Palpate the injured area
 - (d) Measure the limb
 - (e) Arrange X-ray examination.
- } in all cases comparing it
with the sound limb.

What are the Causes of Displacement in Fractures?

- (a) The force which broke the bone.
- (b) Muscular action and spasm.
- (c) Gravity and the weight of the part below the site of fracture.

Describe the Normal Process of Repair in Fractures.

Following the injury a hæmatoma forms between the bone ends, under the raised periosteum and also in the tissues close to the site of fracture. The extent of this hæmatoma varies with the displacement of the fragments and the extent of the damage to the periosteum and soft tissues. Just as repair of a hæmatoma elsewhere depends on granulation tissue the fracture hæmatoma becomes converted into this form of tissue which acts as a scaffold for the final repair. The granulations arise from both ends of the bone and quickly form a complete layer between the two fragments. At this stage the area is vascular. Osteoblasts derived from the broken bone now begin to invade the fibrous tissue and lay down calcium. This process begins first in the outer and central layers of the granulation tissue and the intermediate zone is calcified more slowly. The calcified tissue so produced is called *callus* and it is visible in X-ray films.

Unless the fragments are in perfect apposition the growth of callus is considerable and the bone has the appearance of being united by a plumber's wiped joint.

With the callus production the vascularity decreases and union occurs. The structure of the original bone has still to be restored and this is a more gradual process. The excess of external callus is absorbed and the marrow cavity is reconstituted. Bone lamellæ arranged so that they compensate for any mal-alignment by conforming to the new lines of stress, replace the primary bone. In fractures with little displacement healing may be so perfect that it is impossible to tell even by X-rays that there has been a fracture as little as a year later.

What Factors Influence the Repair of a Fracture?

- (a) Age. Fractures heal rapidly in the young and tend to take longer as age advances.

(b) Type of fracture. If there is a wide gap between the ends union will be slow, but in comminuted fractures union is often rapid owing to the wide area of bone from which osteoblasts may be derived.

(c) Blood supply. If the blood supply to the bone is impaired union is greatly delayed.

(d) Infection.

What is Delayed Union?

Delayed union is the term employed when union of a fracture takes longer than the usual time for such an injury. It is impossible to lay down a definite time beyond which delayed union occurs, because the usual time quoted is two months and many fractures which heal slowly under normal conditions take longer than this time. The term is therefore an inexact one.

The causes of delayed union are :—

(a) Immobilisation for an inadequate period.

(b) Inadequate immobilisation.

(c) Infection.

(d) Impairment of the blood supply to one or both fragments.

(e) Interposition of soft parts.

(f) Over-powerful skeletal traction.

(g) Over-prolonged traction.

(h) The insertion of unsuitable foreign bodies to fix the fragments.

What is the Treatment?

The best treatment is prophylaxis and aims at adequate immobilisation of all fractures until union is complete. The answer to the question "How long would you keep this fracture immobilised?" is not given as so many weeks or days but in four words: "Until it has united." In all cases the splint or plaster must protect the fracture from all shearing strains.

The giving of calcium, parathyroid and vitamin preparations is of little value, and the older methods of treatment, such as Bier's congestion and the use of the limb

supported by walking caliper splints, though giving some good results have been superseded by complete immobilisation. Grafting or fixation of the bone may be employed, but internal fixation does not abolish the need for external fixation until union is secured. Drilling of the fragments followed by immobilisation is of value.

Describe Non-union.

Non-union is shown radiologically by the presence of a gap between the fragments which show smooth, well-defined and even sclerosed margins. There may be a false joint between the bone ends or they may be united by fibrous tissue (fibrous union). Clinically there is obvious abnormal mobility and this can be elicited without much pain.

What is the Treatment ?

Operation is essential in order to break down the sclerosed layers of avascular bone overlying the bone ends. The following methods are employed :—

- (a) Excision of scar tissue, freshening of the bone ends and immobilisation until union is secured.
- (b) Drilling of the bone ends.
- (c) Bone-grafting.

What is the Treatment of Compound Fractures ?

The wound is completely and thoroughly excised as described in the section on wounds. All portions of bone which retain attachment to the soft tissues are preserved but all loose pieces are removed. Any contaminated part of the bone edge is removed with an osteotome and the wound is then closed if that is possible, or packed. The fracture is reduced and plaster is applied or a traction method may be used. Powdered sulphanilamide may be applied to the wound and anti-tetanic serum is given. To prevent œdema and swelling the limb is elevated.

What Methods are Employed in the Treatment of Fractures ?

The treatment of a fracture can be summarised as follows :—

- (a) First-aid treatment.
- (b) Reduction of the deformity.
- (c) Fixation of the fracture in the corrected position until union is sound.
- (d) The restoration of function in the affected part.

It must always be borne in mind that the break in the bone is not the only injury although it may dominate the clinical picture, and the injured soft parts must also be considered in the treatment.

First-Aid Treatment.

This depends often on the ingenuity of the first-aid worker and the materials available. Splints may be made out of any rigid material and handkerchiefs will serve as bandages. Traction splints are of great value in the hands of trained first-aid workers. The aim of first-aid treatment is (a) to fix the fragments to prevent further displacement and pain, (b) to transport the patient with the minimum delay and discomfort to the nearest place where treatment can be obtained.

Reduction or Setting of the Fracture.

Various methods are employed and all require anaesthesia, *e.g.* gas and oxygen, open ether, intravenous or local anaesthesia.

- (a) *Manual manipulation* to correct angular deformity as in greenstick fractures.
- (b) *Traction combined with manual reduction.* This is a very frequently used method, *e.g.* in Colles' fracture, dislocation of the elbow, etc.
- (c) *Continuous traction* by (1) skin traction, (2) skeletal traction. This method is employed in fractures of the long bones of the limbs and is also employed as the method of fixation.
- (d) *Operative or Open Reduction.* This method is employed when other means have failed and when there is gross displacement of a separated fragment which could not be reduced by the other methods.

FRACTURES AND DISLOCATIONS.

FACE—NASAL BONES.

Describe Fracture of the Nasal Bones.

The nasal bones are usually broken by direct violence and the force is the only cause of the displacement. The fracture is often compound as the mucosa of the nose is frequently torn and the fracture is generally comminuted. In compound fractures subcutaneous emphysema may be present.

What is the Treatment?

Mould the fragments into position by means of a pair of artery forceps protected by rubber tubing within the nose and the fingers without. When reduction is satisfactory there is little tendency to redisplacement. Union is rapid. Deformity of the septum may require correction by sub-mucous resection at a later date.

MAXILLA.

How does Fracture occur?

(a) The outer wall of the antrum may be broken by driving in the malar bone ; (b) the nasal process is fractured in injuries to the nose ; and (c) the alveolar margin is often broken during tooth extraction. Fracture usually occurs from great violence, *e.g.* the kick of a horse or a fall of timber. The fracture is diagnosed by the irregularity of the cheek, alteration of the alveolar line and prominence of the soft palate.

Name some of the Complications.

- (a) Subcutaneous emphysema.
- (b) Severe hæmorrhage.
- (c) Injury to the infra-orbital nerve.
- (d) Infection.
- (e) Injury to the naso-lachrymal duct.

How does Fracture of the Zygomatic Arch occur ?

Fracture usually occurs as the result of direct violence from without, but it may break when the maxilla or malar is fractured. The displacement is sometimes limited by the attachment of the temporal fascia above and the masseter muscle below, but the arch may be displaced so far medially that locking of the mandible occurs. The signs are flattening of the cheek which may be masked by the bruising and swelling.

What is the Treatment ?

Unless the deformity is obvious or is causing symptoms, no treatment is required. The deformity is corrected by subcutaneous elevation of the fragments.

MANDIBLE.

What are the Sites of Fracture of the Mandible ?

The mandible is fractured by severe direct violence, the sites of fracture being :—

- (a) Through the canine fossa. At this point the jaw is weakened by the long narrow alveolar cavity, as well as by the mental foramen.
- (b) Near the angle.
- (c) Ascending rami.
- (d) Fractures of the condyles and coronoid processes occur but are rare.

What are the Signs of Fracture ?

Pain ; the mouth can scarcely be opened ; saliva dribbles from the angles of the mouth ; bleeding ; crepitus ; deformity. The teeth are frequently displaced.

Describe the Displacements which occur.

Displacement is not a marked feature, for at the angle the masseter and internal pterygoid muscles balance each other. When the fracture is near the canine tooth the suprahyoid muscles tend to pull the medial fragment downwards while the posterior fragment may be displaced upwards

and inwards by the temporal, masseter and pterygoid muscles.

What is the Treatment ?

(a) First-aid treatment comprises the fixation of the fracture by a four-tail or barrel bandage.

(b) Loose teeth should be removed.

(c) The fracture is reduced and is held in position by wiring adjacent teeth or by internal dental splints with additional support from a barrel bandage.

(d) Antiseptic mouth-washes four-hourly.

How does Dislocation of the Jaw occur ?

It is usually caused by some sudden exertion on the part of the patient or spasmodic action of the depressors of the jaw, as in gaping, fits of laughter, attempting to take too large a bite, or it may occur during tooth extraction. The temporo-mandibular joint only admits of anterior dislocation.

What is the Mechanism of the Dislocation ?

When the mouth is opened, the condyle with the intra-articular disc glides forward on to the eminentia articularis ; but if this be continued too far, and if, at the same time, the external pterygoid muscle contracts forcibly, the condyle slips forwards into the zygomatic fossa, and is then drawn up by the temporal, internal pterygoid and masseter muscles. The dislocation may be unilateral or bilateral.

What are the Clinical Features ?

The mouth is open and cannot be shut ; saliva dribbles, and speech and deglutition are almost impossible : depressions are noticed where the condyles ought to be ; there are prominences behind and beneath the malar bones.

In the unilateral form the symptoms are less marked—the chin inclines to the sound side, and there is a depression in front of one ear only.

What is the Treatment ?

The surgeon lays his thumbs (protected by bandage or a towel) along the mandible and places his fingers firmly

beneath the patient's chin. He then forcibly pushes downwards and backwards with his thumbs in order to disengage the condyle, while at the same time he pushes the chin upwards and forwards with his fingers. A four-tailed bandage should be worn for ten days.

THE UPPER EXTREMITY.

CLAVICLE.

Give the Dislocations of this Bone.

(a) At the *sternal* end—

(1) Forwards (most common).

(2) Backwards } rare.

(3) Upwards }

An upward dislocation can occur only when the rhomboid (costo-clavicular) ligament is torn.

In the backward variety, pressure symptoms may result from interference with the trachea, œsophagus, or innominate veins, giving rise to dyspnœa, dysphagia, or cyanosis on the affected side.

(b) At the *acromial* end—

(1) Upwards.

(2) Downwards (very rare).

What are the Sources of Strength of the Sternal End?

(a) The thick expanded end of the bone, and the powerful *ligaments* round about it. It has no muscular or bony strength.

(b) The mobility of the scapula.

For these reasons, and also because the force is usually transmitted along the long axis of the bone, a fracture is more common than a dislocation.

What are the Clinical Features of the Forward Variety?

The shoulder is displaced downwards, forwards, and inwards; the end of the bone rests in front of the manubrium sterni, and carries its own head of the sterno-mastoid muscle with it. Rigidity, absence of crepitus, and alteration of the bony points are additional features.

How would you treat it ?

(a) A pad in the axilla, to overcome the inward displacement.

(b) A figure-of-eight bandage round the shoulders, to brace them back, and to overcome the forward displacement.

(c) A sling to support the elbow, to counteract the downward displacement.

(d) Operative reduction may be required in late cases if the disability is severe.

Give the Clinical Features and Treatment of Acromial Dislocation.

The usual cause is either a blow from behind or a fall upon the tip of the shoulder. Owing to the inclination of the articular surfaces of the clavicle and the scapula, the displacement is usually upwards. The leading features are :

(a) Rigidity.

(b) Impaired movement of the shoulder, especially in lifting the arm above the level of the shoulder.

(c) Alteration in the bony points ; the acromion projecting beneath the skin, and

(d) The head inclined towards the injured side.

The degree of displacement depends on the extent of the injury to the conoid and trapezoid ligaments.

Reduction is easily performed but retention is difficult. The elbow and clavicle are approximated by encirclement with adhesive tape and a collar and cuff sling is applied for three weeks. In many cases of long standing the disability is slight when the muscles regain their tone but operative fixation may be required.

Mention the Causes of Fracture of the Clavicle.

(a) DIRECT VIOLENCE (rare) : the fracture is transverse and occurs at the point struck.

(b) INDIRECT VIOLENCE (the usual cause) : the fracture is oblique from without inwards, and from before backwards. Its usual position is at the junction of the middle and outer thirds of the bone.

What are the Sites of Fracture ?

- (a) At the sternal end (very rare).
- (b) At the junction of the middle and outer thirds (the usual situation).
- (c) At the coraco-clavicular ligament.
- (d) Outside the coraco-clavicular ligament ; this fracture is usually transverse in direction.

Give the Displacement when the Bone is broken at its usual Situation.

OUTER FRAGMENT—

- (a) Downwards, by the weight of the arm.
- (b) Forwards, by the pectorals and serratus anterior.
- (c) Inwards, because the clavicle normally acts as an out-rigger by keeping the shoulder away from the chest.

INNER FRAGMENT—

Slightly tilted upwards by the sterno-mastoid ; the integrity of the costo-clavicular ligaments prevents any marked displacement.

What are the Signs of this Fracture ?

- (a) Approximation of the point of the shoulder to the sternum.
- (b) The prominence of the outer end of the inner fragment, and a depression under it ; depression of the outer fragment.
- (c) Falling of the arm, and flattening of the shoulder.
- (d) Inability to raise the arm ; crepitus ; tenderness on pressure ; abnormal mobility.

Describe the Treatment.

In cases in which deformity or swelling of the bone must be avoided the patient should lie on a hard mattress with a narrow sandbag between the scapulæ for three weeks.

Reduction of the fracture in other cases is effected by pulling the shoulder outwards, upwards, and posteriorly, and the fracture may then be splinted by various methods. A simple method is that described by Wharton Hood :—apply three strips of adhesive over a felt pad overlying the

site of fracture. The adhesive strips extend from the nipple line to the inferior angle of the scapula and the central one which passes over the line of fracture is applied first. The remaining strips overlap the central one. Cases with more marked displacement may be treated by a figure-of-eight bandage applied over pads in both axillæ. Whatever method of splinting is employed, movements of the hand, elbow and shoulder must be encouraged to prevent stiffness. Union is usually satisfactory in three weeks.

How is Fracture at the Coraco-Clavicular Ligament caused ?

Usually by direct violence. If the fracture occurs between the conoid and trapezoid ligaments there will be no displacement. A simple arm-sling is all the treatment required.

What is the Displacement when the Fracture occurs outside the Coraco-Clavicular Ligament ?

This fracture is practically always caused by a blow on the back of the shoulder.

The small outer fragment is drawn forward until it lies at right angles to the inner long fragment. There is practically *no downward displacement*, as the coraco-clavicular ligament is intact.

SCAPULA.

What are the Fractures of the Scapula ?

- (a) Through the body.
- (b) The acromion process.
- (c) The coracoid process.
- (d) At the surgical neck.

Describe Fracture of the Body.

This fracture results from severe direct violence, and is often complicated by injury to the ribs and lungs. The clinical signs are pain, unusual mobility and crepitus. The displacement is very slight. Treat the fracture by placing a thick soft pad over the broken bone, and a body bandage

to keep the arm to the side. Shoulder movements are encouraged after a few days.

Give the Clinical Features of Fracture of the Acromion.

Fracture of the acromion most commonly follows a fall or blow upon the shoulder. The displacement is very slight, and crepitus is difficult to elicit. Abduction of the arm is interfered with. Non-union frequently occurs, the resulting condition often being mistaken for a separated epiphysis. Union of the acromion is very apt to be by fibrous tissue.

Describe Fracture through the Surgical Neck.

The surgical neck of the scapula passes through the supra-scapular and great scapular notches, and accordingly when fracture occurs the coracoid process is upon the outer fragment. Fracture of the surgical neck is uncommon, but when present it closely simulates a sub-glenoid dislocation of the shoulder. Owing to the rupture of the coraco-clavicular and coraco-acromial ligaments, the outer fragment is depressed. On careful measurement it will be found that the injured arm is lengthened.

Mention the Chief Points distinguishing this Fracture from a Dislocation of the Shoulder.

| FRACTURE OF SURGICAL NECK OF SCAPULA. | DISLOCATION OF SHOULDER. |
|---|--|
| <ol style="list-style-type: none"> 1. Crepitus is present. 2. It can be readily reduced on supporting the arm. 3. The arm is freely moveable, and the <i>coracoid process moves with it.</i> | <ol style="list-style-type: none"> 1. No crepitus. 2. It cannot be reduced by supporting the arm. 3. Rigidity of the arm. |

What is the Treatment ?

In most cases the displacement is slight and the arm should be supported in a sling, shoulder movements being encouraged from the end of the first week. In cases with severe displacement reduction may be secured by traction in an abduction frame.

DISLOCATIONS OF THE SHOULDER JOINT.*Mention the Chief Dislocations.*

- (a) Sub-glenoid.
- (b) Sub-coracoid.
- (c) Sub-acromial.

The rarer varieties are :—

- (a) Sub-clavicular.
- (b) Sub-spinous.

The dislocations are named according to the position of the head of the humerus in relation to the different bony points around the joint.

How does Dislocation occur ?

From violence when the arm is abducted and the muscles caught off their guard, as in falls or blows on the shoulder, elbow, or hand, with the arm outstretched. Sub-spinous dislocation occurs when the arm is in the adducted position.

The head of the bone leaves the capsule at its lower and anterior part, as this is the thinnest and least supported part of the whole capsule. All dislocations, therefore, of the shoulder are primarily sub-glenoid.

Name the General Signs of Dislocation.

- (a) Flattening and squareness of the shoulder.
- (b) A depression below the acromion process.
- (c) An apparent projection of the acromion, with tension of the deltoid.
- (d) The head of the humerus is felt in an abnormal position.
- (e) Rigidity and pain.
- (f) An alteration in the axis of the bone.

(g) A lowering of the anterior fold of the axilla.

(h) DUGAS' test.—The patient cannot place the fingers of the injured limb on the sound shoulder, nor allow them to be placed there by the surgeon, while at *the same time the elbow touches the thorax*. This test is often unreliable.

(i) The vertical measurement of the shoulder from the axilla over the acromion process is from one to two inches greater on the dislocated side.

(j) HAMILTON'S "ruler" test.—If a straight ruler be applied to the outer side of the upper arm, it will touch both the acromion and the external epicondyle of the humerus.

Give the Special Signs of the Sub-coracoid Variety.

The head of the bone lies below the coracoid process, resting against the anterior lip of the glenoid cavity, and the elbow is tilted away from the side. The subscapularis is ploughed up from the subscapular fossa, while the short external rotators of the shoulder are partially torn. Pressure symptoms may arise from compression of the circumflex nerve or the axillary vessels. Dugas' sign is sometimes absent in this form of dislocation. The arm is shortened. The sub-coracoid dislocation is frequently complicated by fracture of the greater tuberosity of the humerus.

Mention the Special Characters of the Sub-acromial Variety.

This variety of dislocation generally occurs when the arm is in a position of adduction and internal rotation. The tuberosities of the humerus are frequently torn away from the shaft, and the infraspinatus is severely damaged. Other points to note are the prominence of the coracoid process, the broadening of the shoulder, and the presence of the head of the humerus beneath the acromion process or spine of the scapula. The arm is shortened.

Describe the Sub-glenoid Variety.

Sub-glenoid dislocation follows forcible abduction of the arm, the head of the humerus coming to lie on the infra-glenoid area of the scapula, and being supported by the

long head of the triceps. The arm is slightly lengthened and rotated out. The head of the humerus can be palpated in the axilla. In some cases the circumflex nerve is injured.

Describe the Chief Methods of reducing a Dislocation of the Shoulder Joint.

(a) *Kocher's Method.* This is the simplest and probably the safest method. Flex the elbow and adduct the arm. Rotate the shoulder slowly outwards and then carry the arm forwards, upwards, and inwards across the chest towards the opposite shoulder. Lastly, rotate the shoulder inwards. The reduction may occur at any stage of the manipulation.

(b) *Miller's Method.* Flex the elbow to a right angle and gradually abduct the shoulder to the horizontal. While an assistant exerts counter traction by means of a towel passed round the thorax, the surgeon applies traction to the arm. Medial rotation may now secure reduction, but it may be necessary to apply pressure upwards through the axilla.

(c) *Heel in the Axilla Method.* The surgeon lies down beside the patient on the floor and places the foot of the side corresponding to the dislocation against the inner wall of the axilla. He then applies traction to the arm.

When the dislocation is reduced the arm is placed in a sling or bandaged to the body and active movements are begun after three weeks.

THE HUMERUS.

Name the Chief Fractures of the Humerus.

- | | | |
|--------------|---|--|
| A. UPPER END | { | Anatomical neck. |
| | { | Surgical neck. |
| | { | Tuberosities. |
| B. SHAFT | { | Above the insertion of the deltoid muscle. |
| | { | Below the insertion of the deltoid muscle. |
| C. LOWER END | { | Supracondylar. { Transverse. |
| | | { T- or Y-shaped. |
| | { | Either condyle. |
| | { | Internal epicondyle. |

Describe Fracture of the Anatomical Neck.

It usually occurs in elderly people, and is brought about by direct violence, i.e. a fall upon the shoulder. It may be impacted or non-impacted. The displacement is slight, but the head of the bone may be rotated. Crepitus is present, shortening occurs, and the shoulder becomes flattened. When impacted, there is an antero-posterior broadening.

The diagnosis is made by radiography.

What is the Treatment ?

As the injury occurs in the aged, a good functional result is more important than reduction without deformity. The arm is placed in a sling or body bandage and movements are begun at once. Grossly displaced and comminuted fragments may need to be removed.

Describe Fracture of the Surgical Neck.

The surgical neck of the humerus is the area between the line of the epiphysis and the upper limit of the attachment of the pectoralis major. Fracture in this situation is most commonly met with in adults or the aged. It may be due to direct, indirect, or muscular violence. As in fracture of the anatomical neck, impaction may be present. When the line of fracture is transverse, deformity is slight; when oblique, the line of fracture is downwards, forwards, and inwards, and the upper fragment tends to become abducted and rotated out, while the lower fragment is pulled upwards and inwards by the muscles attached to the bicipital groove.

How is this Injury distinguished from Sub-glenoid Dislocation of the Shoulder ?

- (a) The arm is shortened, not lengthened.
- (b) There is increased mobility, not rigidity.
- (c) By the position of the head of the bone.
- (d) The shoulder is not flattened.
- (e) The head and tuberosities do not move with the rest of the arm.
- (f) By X-ray examination.

What is the Treatment?

Cases without displacement require immobilisation by means of a sling or body bandage. Movement of the distal joints of the limb is practised from the start and at the shoulder after two weeks. In cases with the typical displacement an abduction splint will be necessary following reduction by traction on the arm.

Describe Fractures of the Shaft of the Humerus.

Fractures of the humeral shaft may be brought about by direct or indirect violence. In children the line of fracture

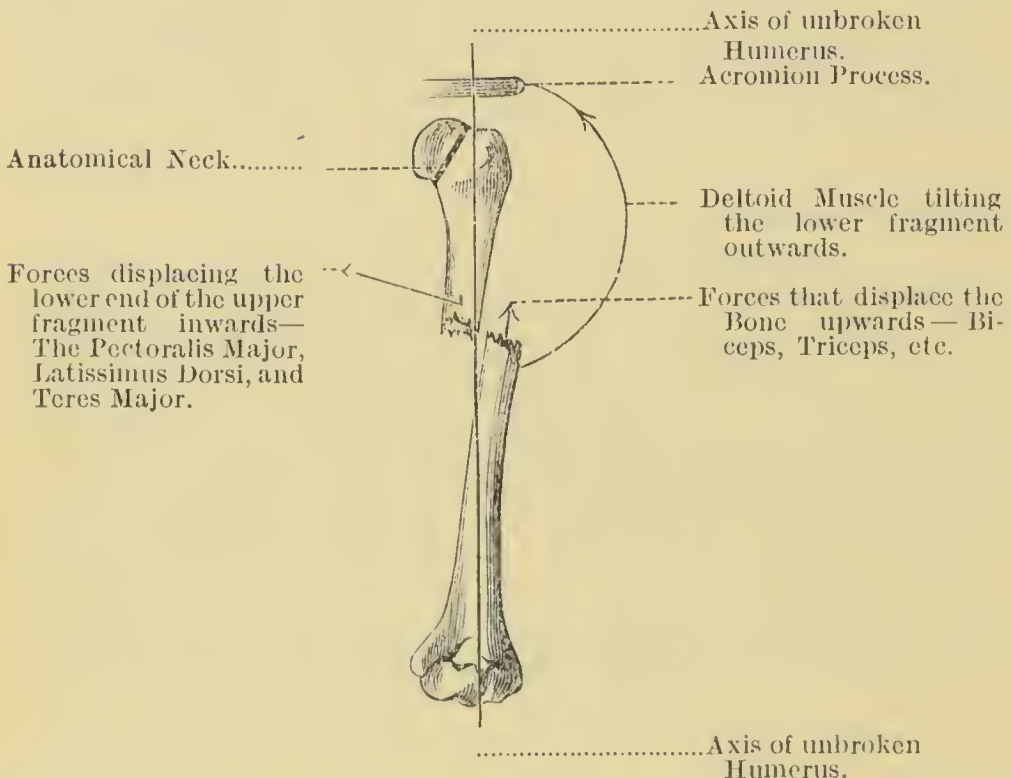


FIG. 9.—FRACTURE ABOVE THE DELTOID.

is usually transverse, while in adults it is generally oblique. The displacements most frequently are :—

- | | | |
|---------------------------------|---|---|
| (a) ABOVE DELTOID INSERTION. | { | Upper fragment <i>Inwards</i> by muscles inserted into bicipital groove. Lower fragment <i>Upwards</i> by bi- ceps and triceps; <i>Outwards</i> by deltoid. |
|---------------------------------|---|---|

- (b) BELOW DELTOID INSERTION. { Upper fragment *Outwards* by deltoid.
Lower fragment *Upwards and Inwards* by biceps, triceps, coraco-brachialis, and brachialis.

The musculo-spiral nerve is very apt to be injured in fractures of this region. The shaft of the humerus is a common site for non-union.

Give the Treatment for Fracture of the Shaft.

Absolute anatomical reduction is not necessary and many cases unite with incomplete fixation. A very simple method

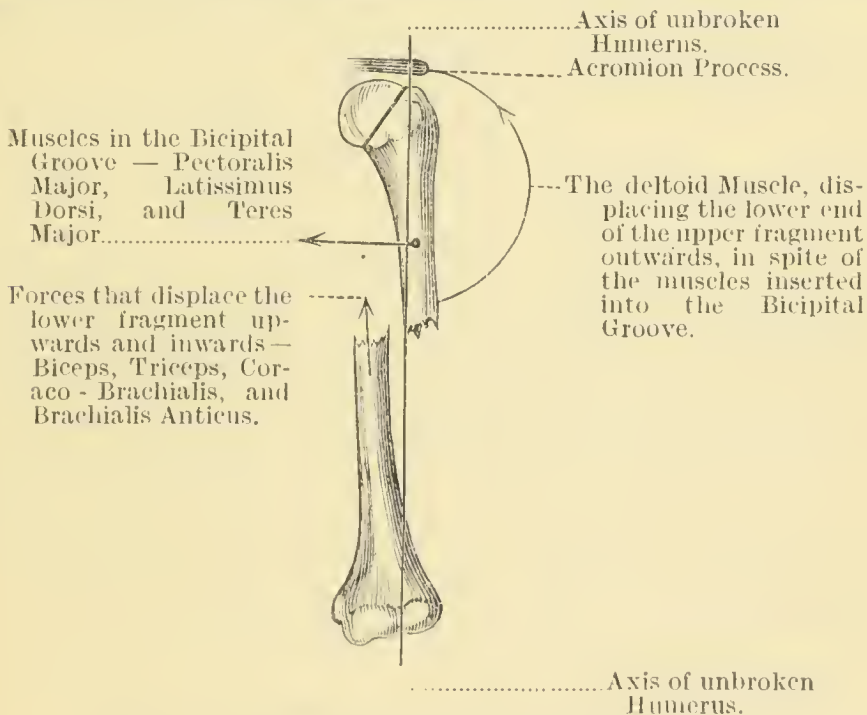


FIG. 10.—FRACTURE BELOW THE DELTOID.

is to apply a collar and cuff sling, a 2 lb. weight is then attached to the elbow by means of adhesive to secure a mild degree of traction and the fracture is protected from trauma by Gooch splinting.

Alternatively a plaster of Paris slab may be applied from the axilla round the elbow and up the outer side of the limb.

Should union be delayed the shoulder and elbow joints must be immobilised by the application of a shoulder spica of plaster of Paris.

Describe Fracture of the Medial Epicondyle.

The medial epicondyle may be torn off by traction upon the ulnar collateral ligament, or may be knocked off by falls upon the elbow. The fragment of bone is dragged downwards and forwards by the flexor muscles taking origin from it. The ulnar nerve may be seriously damaged.

In dislocations of the elbow, reduction in cases complicated by this fracture may lead to the medial epicondyle becoming displaced into and locked in the joint. Operation is then usually required to secure reduction and the epicondyle is fixed in position by suture of the periosteum. In cases with little displacement the joint is immobilised in a sling until the synovitis subsides and movements are then begun. The ulnar nerve may be damaged at the initial injury or ulnar neuritis may be a late sequel.

Describe Supracondylar Fracture of the Humerus.

Two types of fracture occur: (a) the common type, which occurs most frequently in young people from indirect violence following falls on to the outstretched hand in which the line of fracture runs obliquely upwards antero-posteriorly and in which the small lower fragment is displaced posteriorly carrying with it the forearm bones; (b) the exactly opposite injury with the line of fracture running downwards from before backwards and resulting from falls on the point of the elbow. The small lower fragment is displaced forwards, taking with it the forearm bones.

What are the Clinical Features?

- (a) Swelling, bruising and deformity of the elbow.
- (b) Forearm held in the semi-extended position.
- (c) Bony points of tip of olecranon and the two epicondyles are in normal position. Cf. dislocation of the elbow joint.
- (d) Crepitus is easily felt.
- (e) X-ray examination shows the line of fracture just above the articular surface and the small lower fragment is displaced posteriorly and upwards in most cases, but the opposite type must be noted and there may be no displacement.

What are the Possible Complications ?

- (a) Injury to the brachial artery or veins from the upper fragment.
- (b) Injury to the median nerve.
- (c) Volkmann's ischæmic contracture.

What is the Treatment ?

Fractures with posterior displacement are manipulated by traction in the extended position followed by flexion of the forearm to 45 deg. above a right angle while the traction is maintained. If there is any lateral displacement it is corrected by manipulation and a posterior plaster splint is applied and the flexed position maintained by means of a collar and cuff sling. Careful watch for any difference in the two radial pulses must be kept.

In cases with anterior displacement traction is applied and the limb is put up in the extended position in plaster.

Describe Diacondylar Fracture of the Humerus.

This fracture occurs at the level of the epicondyles and the displacement is the same as that of a supracondylar fracture. Owing to the line of fracture passing through the fossæ of the lower end of the humerus perfect reduction is essential and is secured by the same manipulation as in supracondylar fracture.

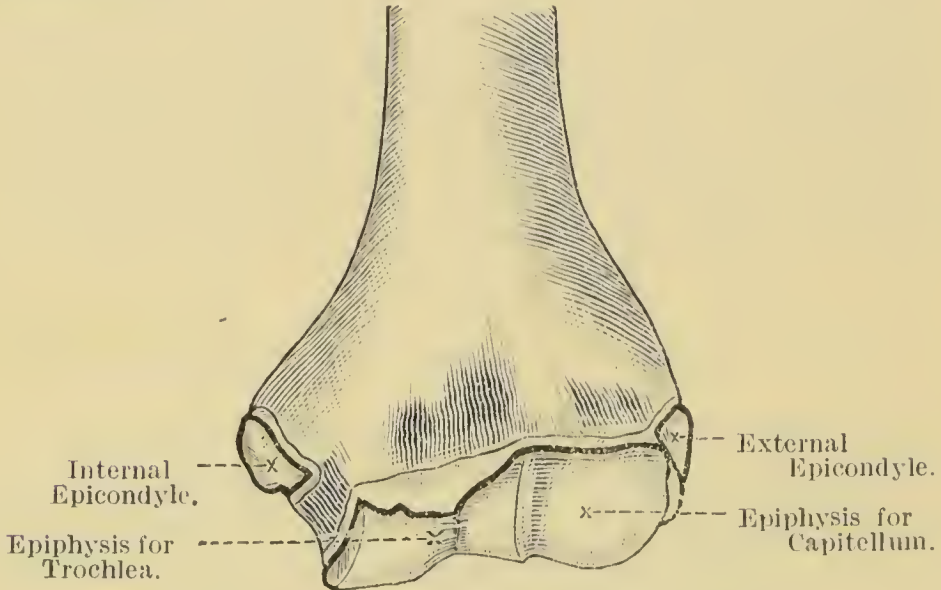
Describe Intercondylar (T and Y) Fracture of the Humerus.

This injury follows direct violence to the flexed elbow and is a fracture just above the level of the supracondylar type with the lower fragment also fractured vertically. It occurs most often in old people and the displacement is often severe. Reduction is not easy, but even perfect reduction may be followed by bad function. The fracture should be reduced by traction and put up in plaster in the position in which reduction can best be maintained, but operative measures are frequently necessary.

Describe the Lower Epiphysis of the Humerus.

A centre for the capitulum and outer half of the trochlea appears at two years and the centre for the remainder of

the trochlea appears at eleven years. The lateral epicondyle has also a small centre which begins to ossify in the twelfth year and all these centres fuse about fourteen to form one epiphysis which joins the shaft at seventeen. The medial epicondyle takes no part in the formation of this epiphysis and is developed from a centre which appears at five years and joins the shaft at eighteen, the epiphyseal line being extracapsular.



(Complete union at 18 years of age.)

FIG. 11.—LOWER END OF HUMERUS.

How is Separation of the Lower Humeral Epiphysis Diagnosed?

Forward displacement of the lower epiphysis is not uncommon but can only be diagnosed by X-ray examination. There is of course synovitis of the elbow and limitation of movement of the joint. The displacement is corrected by extension of the joint.

REGION OF THE ELBOW.

What are the Forms of Dislocation of the Upper Ends of the Radius and the Ulna?

- (a) Backwards.
- (b) Forwards.
- (c) Laterally.

NOTE—Dislocation of the elbow is often complicated by fracture of the humerus, olecranon, or coronoid process.

The most common dislocation is posterior, the radius accompanying the ulna, because the annular ligament escapes injury. This form of dislocation is very common in children. It is caused by indirect violence, *e.g.* a fall on the palm of the hand with the elbow joint extended, as in this position the coronoid process loses its grasp of the trochlea. In addition, it may be brought about by a twist of the forearm.

Give the Chief Signs.

(a) The arm is semi-flexed, and either pronated or midway between pronation and supination.

(b) There is a projection behind (the olecranon process), and a swelling in front *below* the crease caused by flexion of the joint: this is the articular surface of the humerus covered by the brachialis muscle and the tendon of the biceps.

(c) General rigidity of the arm.

(d) An increased distance between the olecranon process and the internal epicondyle.

(e) Lateral movement of the joint.

(f) The relative position of the head of the radius to the external epicondyle is altered.

(g) The antero-posterior diameter of the joint is increased.

(h) The forearm is shortened about an inch.

(i) X-ray examination confirms the diagnosis and eliminates fracture.

The dislocation must be diagnosed from—

1. Supracondylar fracture of the humerus, and
2. Separation of the lower humeral epiphysis.

How is a Backward Dislocation reduced?

The dislocation is reduced by traction but no forcible traction over the surgeon's knee or hyperextension is necessary or desirable. Should there be no associated fracture, reduction will be stable, but it is sometimes better to apply a posterior plaster slab if there is any doubt. Lateral displacement is corrected by lateral compression with the fingers and the elbow is put up in a posterior plaster slab in just over right-angle flexion.

Movements of the hand, fingers and shoulder are encouraged from the start and after twenty-one days active movements of the elbow are begun.

What are the Likely Complications of this Dislocation ?

- (a) Injury to the brachial artery.
- (b) Fracture of the medial epicondyle and its displacement into the elbow joint.
- (c) Following reduction (b) may not be corrected and in some cases may be associated with ulnar palsy.
- (d) Myositis ossificans traumatica of the brachialis.
- (e) Fracture of the coronoid process or olecranon.

Describe Anterior Dislocation of the Head of the Radius.

This is the second most frequent dislocation at the elbow joint and it is almost always accompanied by a fracture of the upper third of the shaft of the ulna (fracture of Monteggia).

It is the result usually of indirect violence, *e.g.* a fall on the hand with the forearm in the extended and supinated position. It occurs chiefly in young people and is common in children. In some cases it follows direct violence to the posterior surface of the upper third of the forearm bones.

The clinical features are :—

- (a) The head of the radius lies in front of the lateral epicondyle and the orbicular ligament is torn.
- (b) The forearm is in a position of semi-flexion and pronation.
- (c) Flexion of the elbow is limited by the presence of the head of the radius in the radial fossa of the humerus.
- (d) Signs of fracture of the upper third of the ulna may be detected.
- (e) X-ray examination confirms the diagnosis.

What is the Treatment ?

The dislocation is easily reduced by traction on the forearm and direct pressure on the head of the radius. Owing to the rupture of the orbicular ligament and the pull of the biceps tendon redislocation occurs at once unless the elbow is flexed and supinated, and the joint should therefore be

immobilised in this position. If X-ray confirms the reduction the flexed position is maintained for four weeks and movement of the elbow is regained by gradually increasing active use of the joint. Operative fixation has been described.

Describe Subluxation of the Head of the Radius.

It is a form of injury apt to happen in childhood from a sudden tug of the arm (by the mother or nurse). This sudden pull, when the child is not expecting it and the muscles are off their guard, is apt to produce a partial dislocation of the head of the radius anteriorly. The child gives a sudden cry of pain and the arm becomes useless. There is marked limitation of flexion of the elbow and pronation and supination are lost. The diagnosis is frequently missed but the typical history should leave little room for doubt.

Treatment is by manipulation, which when quickly performed is only momentarily painful and therefore can be performed without an anæsthetic. Apply gentle traction to the forearm, flex it and pronate and supinate and there is often an audible click and the child immediately recovers full movement. In cases seen at once no further treatment is required, but if the condition has been present for some time the joint should be put at rest in a sling for a few days.

Describe Fracture of the Olecranon.

Fracture of the olecranon process of the ulna may result from direct violence, *e.g.* a fall on the point of the flexed elbow or from muscular action as in a fall on the flexed forearm, causing the triceps muscle to avulse the upper part of its insertion. The displacement varies, depending on the damage done to the triceps expansion. Fractures near the proximal end tend to show considerable displacement, whereas those occurring more distally show less deformity but involve the articular surface of the semilunar notch more seriously.

The signs of the fracture are pain, swelling and limitation of elbow movements owing to the hæmarthrosis. There is marked tenderness over the olecranon and in many cases

the gap in the bone may be palpable. In cases with displacement the relationship of the bony points at the elbow is upset. X-ray reveals the extent of the displacement. Anterior dislocation of the elbow joint may be a complication.

What is the Treatment?

Should this lesion be left alone, healing occurs by fibrous union, but the resulting stretching of the triceps causes permanent weakness of extension. The aim is to correct deformity and also to secure full movement of the elbow.

In cases of fracture through the middle of the olecranon with little separation of the fragments, displacement may be corrected by extension of the joint and the application of a pad and strapping over the upper fragment. Immobilisation in extension for four weeks is usually sufficient.

In cases with greater separation, open reduction with suture of the fragments and immobilisation in plaster at right angle flexion for four weeks is required.

In elderly people better movement follows excision of the upper fragment and the reconstitution of the triceps muscle by suture.

FOREARM.

How would you classify Fractures of the Radius?

- (a) Fracture of the head or neck.
- (b) Fracture of the shaft above the insertion of pronator teres.
- (c) Fracture of the shaft below the insertion of pronator teres.

- (d) Fractures of the lower end

| | |
|---|--|
| { | Colles' fracture. Smith's fracture. Fracture of the radial styloid. Marginal fractures of the lower articular surface. |
|---|--|

Classify Fractures of the Ulna.

- (a) Fracture of the olecranon.
- (b) Fracture of the coronoid process.
- (c) Fracture of the shaft.
- (d) Fracture of the shaft with dislocation of the head of the radius.

Give the Displacement in Fracture of the Radius above the Pronator Teres.

This is usually caused by indirect violence, as in a fall on the hand.

The UPPER FRAGMENT is flexed by the biceps, and fully supinated by the same muscle and the supinator.

The LOWER FRAGMENT is fully pronated by the pronator quadratus and the pronator teres.

Describe the Displacement in Fracture below the Pronator Teres.

The UPPER FRAGMENT is tilted forward, and supinated by the biceps and supinator, and inwards by the pronator teres. The displacement, however, is not great, as the muscles almost balance each other.

The LOWER FRAGMENT is drawn towards the ulna and pronated by the unopposed action of the pronator quadratus, while the brachio-radialis tilts up the styloid process and depresses the upper end of the fragment.

How is the Ulna usually fractured and what Displacement occurs?

Generally by direct violence, as in carrying something in the hand, *e.g.* a tray, when the foot slips, and, to save the contents of the hand, the whole force of the fall is received on the posterior edge of the ulna. So also it may be broken by a fall on the edge of a doorstep, or by a blow from a stick, when the arm is held up to protect the head. Both fragments are driven towards the radius by the force that breaks the bone; the muscles do not cause great displacement.

What is the Cause of Fracture of both Bones of the Forearm ?

Fracture of the shafts of the radius and ulna results from direct violence when both bones break at the same level and from indirect violence when the bones break at their weakest points, *i.e.* lower third of ulna and upper third of the radius.

The displacement of the radius is of importance and has already been described.

Describe Fracture of the Head of the Radius.

Fracture of the head of the radius follows indirect violence, the head of the bone impinging on the capitulum. The injury may be a crack across the articular surface, the detaching of a segment of the articular surface or complete comminution of the head. The neck may be fractured in some cases, leading to complete separation of the head.

There is effusion into the elbow joint with obliteration of the normal concavity over the radial head and local tenderness. Extension is limited and pronation and supination are impossible.

What is the Treatment ?

In cracks of the articular surface the elbow is placed in a sling at right-angle flexion for two weeks and thereafter active use is encouraged.

In more severe cases permanent loss of extension and rotation frequently result and the best treatment is excision of the head of the bone.

Describe Colles' Fracture.

This fracture is the result of indirect violence following a fall on the outstretched hand. The line of fracture is oblique from below upwards and backwards. It passes through the lower end of the bone about three-quarters of an inch from the articular surface.

Traction on the internal lateral ligament avulses the ulnar styloid or the ligament may be separated from it.

The fracture is most commonly impacted but may be comminuted. The *displacement* of the lower fragment is (a) the whole fragment is displaced backwards; (b) it is

rotated backwards ; (c) it is displaced to the radial side and is often impacted ; (d) it is displaced upwards.

The Clinical Features.—The symptoms are pain and inability to use the wrist. In cases with displacement, the typical dinner-fork deformity is present. There is tenderness proximal to the articular surface and over the ulnar styloid. The normal relationship of the styloids is upset. In cases with no displacement there may only be tenderness. The hand is held pronated and is frequently supported by the opposite hand. X-ray reveals the degree of displacement and comminution.

What is the Treatment ?

Cases with displacement require reduction under general or local anæsthesia. The fracture is disimpacted by traction and is then reduced by the pressure of the surgeon's thenar eminence of the corresponding side over the lower fragment pronating and pushing it forwards and to the ulnar side.

Reduction should be perfect, and is maintained by the application of a dorsal plaster slab from the elbow to just proximal to the metacarpo-phalangeal joints. Finger exercises and shoulder and elbow movements are carried out from the start. The plaster is retained for four to five weeks.

What is Smith's Fracture ?

When a person, with the wrist in extreme flexion, falls upon the knuckles and dorsum of the hand, a fracture is sometimes produced the very reverse (as regards the displacement) of Colles'. This fracture is called Smith's fracture.

The fracture is reduced by the opposite manipulation to that for Colles' fracture and immobilisation is carried out in the same way.

Describe Fracture of the Radial Styloid.

Following a fall on the outstretched hand or in backfire injuries, the lateral part of the carpus may impinge on the

outer part of the articular surface of the radius and cause a fracture through the base of the radial styloid.

There may be no displacement or the styloid may be displaced laterally.

The displacement is reduced by manual compression and plaster is applied for five weeks. Healing of the articular surface in good position is essential to restore function.

What is the importance of Posterior Marginal Fracture of the Radius?

The fracture passes through the groove for the tendon of the extensor pollicis longus which may be gradually abraded until "spontaneous" rupture occurs. For this reason these apparently trivial injuries should be treated by immobilisation for four weeks.

Describe Fracture of the Coronoid Process.

Fracture of this process is a complication of posterior dislocation of the elbow. After reduction the elbow should be kept in full flexion for three weeks.

Describe Fracture of the Ulna with Dislocation of the Head of the Radius.

The fracture occurs in the upper third of the ulna which is angled anteriorly and the head of the radius is dislocated forwards. The fracture is reduced by traction and the dislocation by flexion of the elbow with backward pressure over the radius. The elbow is immobilised in right-angle flexion until union is sound.

What is the Treatment of Fracture of Both Bones of the Forearm?

Greenstick fracture in children is easily corrected by manipulation, but complete fractures require different treatment. The displacement is corrected by traction. The elbow is passed through a sling fixed to the wall and is flexed



FIG. 12.—SUB-CORACOID DISLOCATION OF
THE SHOULDER.



FIG. 13.—ADDUCTION FRACTURE OF
SURGICAL NECK OF THE HUMERUS.



FIG. 14.—POSTERIOR DISLOCATION OF
THE ELBOW.



FIG. 15.—FRACTURE OF OLECRANON.

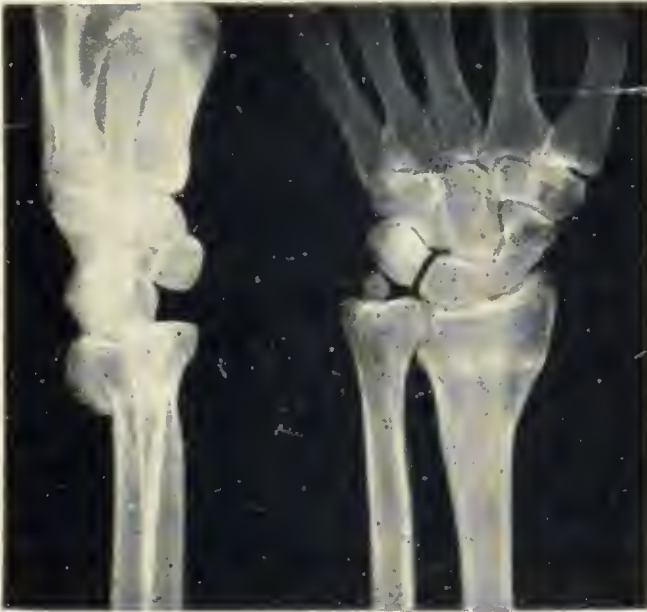


FIG. 16.—ANTERO-POSTERIOR AND LATERAL
VIEWS OF COLLES' FRACTURE.



FIG. 17.—COMPRESSION FRACTURE OF
BODY OF VERTEBRA.



FIG. 18.—ABDUCTION FRACTURE OF NECK
OF FEMUR.



FIG. 19.—ABDUCTION FRACTURE DISLOCATION
OF ANKLE (POTT'S FRACTURE).

to a right angle. Strong manual traction is applied to thumb and fingers. A posterior plaster splint is then moulded into position, extending from shoulder to the heads of the metatarsals. When this has set, the traction may be relaxed and the plaster completed.

Owing to the displacement, fractures of the radius above the pronator teres are put up with the forearm flexed to a right angle and completely supinated. Fractures below this level and fractures of the shaft of the ulna are put up in a position midway between pronation and supination.

Describe Separation of the Lower Radial Epiphysis.

This is an injury equivalent to a Colles' fracture in the young person. The injury is a fracture separation occurring proximal to the epiphyseal cartilage and the displacement is similar to Colles' fracture. Reduction and treatment are those of Colles' fracture.

Injury to the epiphysis may cause diminished growth of the bone.

WRIST AND HAND.

Describe Fracture of the Carpal Navicular (Scaphoid).

This injury follows indirect violence from falls on the outstretched hand. Clinically there is swelling on the radial side of the joint in the anatomical snuff-box, where tenderness is found. Movements of the wrist are limited, especially dorsiflexion and radial deviation.

The fracture is diagnosed by X-ray examination, which in doubtful cases must be repeated in three weeks, and in all cases a third oblique view should be taken in addition to the routine X-rays.

Treatment.—The wrist must be immobilised until the fracture has united radiographically. The plaster is applied with the wrist in dorsiflexion and slight ulnar deviation, and should immobilise the metacarpals without restricting movements of fingers and thumb.

Describe Dislocation of the Lunate (Semilunar) Bone.

Anterior dislocation of the lunate occurs following severe violence to the extended wrist. The injury is really a posterior dislocation of the rest of the carpus, occurring about the lunate. The bone comes to lie in the carpal tunnel and there is pressure on the median nerve and flexor tendons.

The front of the wrist is swollen, thickened and tender. Movements of the wrist are limited as are those of the fingers, which remain semi-flexed. There may be median paralysis.

X-ray shows the dislocation in the lateral view, the semilunar surface of the bone pointing anteriorly or even proximally, depending on the degree of displacement.

Treatment.—In recent dislocations, reduction is carried out by traction on the extended fingers and thumb, but in old-standing dislocations the bone should be excised.

Describe Bennett's Fracture.

This injury is an oblique fracture of the base of the first metacarpal which separates a small portion of the ulnar side of the articular surface. The bone is displaced proximally, laterally and posteriorly.

The injury follows indirect violence in the line of the thumb and the symptoms are pain and swelling and inability to use the thumb. Reduction is easy, but retention of the position can be secured only by traction, which should be maintained for three weeks.

Describe Fracture of the Metacarpal Bones.

SHAFT.—The shafts of the metacarpal bones are broken transversely by direct violence and usually obliquely by indirect violence. Owing to their firm attachments, displacement is usually slight. There is pain, swelling and tenderness over the site of fracture and the line of the knuckles is distorted. The deformity is corrected by manipulation and a splint is applied which will permit finger movements from the start.

NECK.—Fracture of the neck of the second and fifth metacarpals is not uncommon and the distal fragment is displaced forwards. The displacement is corrected by pushing the flexed finger posteriorly, and is immobilised by a posterior plaster splint (Watson Jones).

Describe Fracture of Proximal Phalanx.

Fracture of the proximal phalanx is associated with backward and proximal displacement of the distal fragment owing to the action of the lumbricals and interossei. The deformity is corrected by traction with the metacarpophalangeal joint flexed to 45° and the proximal interphalangeal joint flexed to 90° .

Describe Dislocation of the First Metacarpo-Phalangeal Joint.

This injury follows excessive dorsiflexion of the thumb, the lateral and glenoid ligaments being torn from the metacarpal. The head of the metacarpal is embraced by the tendons of flexor pollicis brevis and the tendon of flexor pollicis longus is dislocated to the ulnar side. Reduction is usually secured by traction but may be prevented by (a) the glenoid ligament, (b) the flexor pollicis brevis and the sesamoids, (c) the tendon of flexor pollicis longus. Open reduction is necessary if failure occurs.

FRACTURES OF THE CRANIUM.

Describe Fractures of the Cranial Vault.

Fracture by *direct* violence is sometimes “*fracture by bending*” ; fracture by *indirect* violence is called “*fracture by bursting*.”

Fracture by *contre-coup* means that the break occurs at a spot opposite to the seat of injury.

Owing to the inelastic nature of the inner table, it is usually more damaged than the outer table.

Classify Fractures of the Cranial Vault.

- (a) Fissured.
- (b) Punctured.
- (c) Comminuted.
- (d) Depressed—the latter being subdivided into pond (circular depressions), gutter (linear depressions), and indentation fractures.

In children, especially those suffering from rickets, greenstick fracture may occur.

Give the Treatment.

Compound depressed and comminuted fractures should be operated on as early as possible. Simple depressed fractures may be exposed, and the sunken bone elevated, or the surgeon may wait and operate only if symptoms of pressure or irritation supervene.

What Conditions simulate Fissured Fractures?

- (a) Normal sutures.
- (b) Edge of the torn pericranium.

A fissured fracture appears as a bleeding, more or less straight, *red line*, which grates under the finger-nail.

A *suture* is not a red bleeding line, is not straight, but is zigzag and serrated.

The *edge of the torn pericranium* is smooth, does not grate under the finger-nail, and shows a slight yielding to digital pressure.

What Conditions simulate Depressed Fractures?

- (a) Hæmorrhage *into* the scalp.
- (b) Craniotabes, where the bones are thinned in patches (usually in the occipital region), so that they readily yield under the pressure of the finger. The commonest causes of craniotabes are rickets and congenital syphilis.

FRACTURES OF THE BASE.

Give the Causes of Fractures of the Base.

I. ANTERIOR FOSSA.—Blows on forehead, nose or face.
Punctured wounds of orbit or nasal fossæ.
Extension of a fracture of the vault.

II. MIDDLE FOSSA.—Severe violence to the vault.
Blows on symphysis menti.
Punctured wounds of nasal fossæ.

III. POSTERIOR FOSSA.—Severe violence to the vault.
Falls upon the feet or buttocks.

Describe Fractures of the Anterior Fossa.

When the fracture is compound, blood escapes into the nose and naso-pharynx. Profuse and long-continued hæmorrhage suggests a tear of the superior sagittal (longitudinal) sinus, the ophthalmic, or meningeal vessels. Cerebro-spinal fluid trickles down the pharynx, but can rarely be detected. A sub-conjunctival ecchymosis often occurs. It is triangular in shape, and extends forwards from the outer canthus of the eye. Palpebral or retinal hæmorrhage may be present.

If the frontal air sinuses be involved, surgical emphysema may occur, or a pneumatocele capitis form.

The commonest cranial nerves to be injured are the first (olfactory) and the second (optic). If the lesser wing of the sphenoid be broken, then the nerves passing through the superior orbital fissure (oculo-motor, trochlear, ophthalmic division of trigeminal, and abducens) may be implicated.

Describe Fracture of the Middle Fossa.

A dark sanious fluid may be observed welling from the ear. It consists of blood and cerebro-spinal fluid. If the membrana tympani is intact, the fluid trickles down the Eustachian tube into the naso-pharynx. Bright scarlet

blood escapes when the vessels of the tympanic membrane are ruptured.

The nerves exposed to injury are the second and third divisions of the trigeminal, and the facial and auditory.

Describe Fractures of the Posterior Fossa.

In the majority of cases there are no special signs as the patient dies, owing to interference with the respiratory centre. If he survive, on the third or fourth day a diffuse extravasation of blood is noticed in the posterior part of the scalp and nape of the neck.

What is the Treatment of Fractures of the Base?

The treatment depends on the extent, nature and severity of the associated injury to the brain and is discussed in another section. In hæmorrhage from the ear it is gently swabbed out and kept clean externally. Syringing must not be employed.

RIBS AND STERNUM:

Describe Fracture of the Sternum.

Fracture of the sternum is a rare single injury and usually accompanies fractures of the ribs or fracture-dislocations of the spine. It may follow direct or indirect violence. The fracture may be transverse, oblique or vertical, and usually involves the junction of the manubrium with the body of the bone. The lower fragment may overlap the upper one. The signs of the fracture are (a) shock ; (b) dyspnœa ; (c) local pain and tenderness with palpable irregularity of the bone ; (d) signs of injury to intra-thoracic viscera.

The deformity is corrected by bracing back the shoulders and hyperextending the spine and then strapping is applied. The patient should be kept in bed for three weeks.

Give the Causes of Fracture of the Ribs.

1. External violence $\left\{ \begin{array}{l} (a) \text{ Direct.} \\ (b) \text{ Indirect.} \end{array} \right.$
2. Muscular action (rare) as in parturition.

With *direct* violence—the fracture occurs at the point struck, and the fragments are driven *inwards*; with *indirect* violence—the ribs usually give way near their angles, and the fragments are driven *outwards*.

Mention the Chief Complications of Fractured Ribs.

- (a) Injury to the pleura or lung.
- (b) Wounds of the heart and pericardium.
- (c) Laceration of intercostal vessels.
- (d) An external wound.
- (e) In rare cases, the diaphragm may be penetrated and certain of the abdominal viscera injured.

What are the Signs of a Fractured Rib?

The ribs usually affected are the 4th, 5th, 6th, 7th, and 8th.

- (a) Severe lancinating pain over the injured part, which is aggravated on taking a deep inspiration, or coughing.
- (b) Crepitus may be detected on palpation; if not, it may be recognised on listening with a stethoscope.
- (c) Pressure on a distal part of the rib elicits pain at the seat of fracture.
- (d) X-ray examination may fail to reveal any injury in oblique fractures with little displacement.

Fractured ribs most frequently occur in adults following direct blows or crushing of the chest wall.

What is the Treatment?

Immediate operation is indicated when complications are present. Otherwise the injured side is fixed as far as possible by the application of strips of adhesive plaster. Each strip is about two inches in breadth and is applied firmly in the position of full expiration, extending from the mid clavicular line of the normal side to the scapular line of the same side. If there are no complications ambulant treatment suffices.

VERTEBRAL COLUMN.

Classify Injuries of the Spine.

- (a) Fractures of the vertebral body (lower dorsal and upper lumbar).
- (b) Fracture-dislocation.
- (c) Dislocation (cervical spine).
- (d) Fracture of the processes.

Describe Fracture of the Vertebral Body (Compression Fracture).

Compression fracture of the vertebral body results from hyperflexion of the spine, as in falls from a height in the sitting or standing position, and from heavy weights falling on to the flexed spine, *e.g.* fall of stone from the roof of a mine. The anterior part of one or more vertebral bodies gives way and the body becomes wedge-shaped. Owing to the powerful ligaments binding the laminae and vertebral processes together, there is frequently no further displacement. In cases of severe violence the ligaments may rupture, the upper portion of the spine is dislocated forwards, and the cord may be compressed by the posterior margin of the uppermost vertebral body below the dislocation.

In cases of compression fracture without dislocation the signs and symptoms are often insignificant. Pain at the site of fracture, tenderness over one or more spinous processes, spasm of the posterior spinal muscles, and limitation of movement and sometimes undue prominence of the spine of the affected vertebra are the features.

The signs of fracture-dislocation are (a) marked prominence of the injured vertebra ; (b) distinct depression above the prominence ; (c) pain and tenderness over the fracture ; (d) total absence of movement and sensation below the site of injury.

X-ray examination in the lateral plane may show slight wedging of the vertebra or fracture of the upper or lower margins of the front of the vertebral body. In cases with dislocation the X-ray shows the nature of the deformity and the association of lateral displacement.

What is the Treatment of Compression Fracture?

Simple compression fractures and fracture-dislocations without lateral displacement are corrected by hyper-extension of the spine by suspension of the feet of the prone patient or by suspending the prone patient between two tables. A plaster jacket is then applied and is retained for four to six months, depending on the severity of the fracture. After a few days the patient is allowed up and begins exercise.

Describe Fracture-dislocation of the Cervical Region.

Complete fracture dislocation of the upper part of the cervical region, *i.e.* the part above the third intervertebral disc, is always fatal, owing to the centres for the phrenic nerve being destroyed. Damage to the segments from the fifth cervical to the first thoracic is recognised by the following signs :—

- (a) The patient lies in a characteristic attitude, the shoulders are abducted, and externally rotated, the elbows, wrists, and fingers are flexed, and the fore-arms are completely supinated.
- (b) Sensation is retained down to the level of the second intercostal space, and down the radial side of the arms.
- (c) Slow pulse.
- (d) Priapism.
- (e) Elevation of temperature.
- (f) Retention of urine and fæces.
- (g) Because of injury to the cilio-spinal region—recession of the globe, contracted pupils, narrowing of the palpebral fissure, and loss of the cilio-spinal reflex.

Describe Fracture-dislocation of the First Thoracic Vertebra.

The attitude is one of slight abduction at the shoulder, partial flexion of elbow, slight flexion of fingers, and the forearm is semiprone. Sensation is lost along the distribution of the ulnar nerve.

Describe Fracture-dislocation of the other Thoracic Vertebrae.

The upper limit of anæsthesia is represented by a horizontal band. Above this is a zone of hyperæsthesia, where

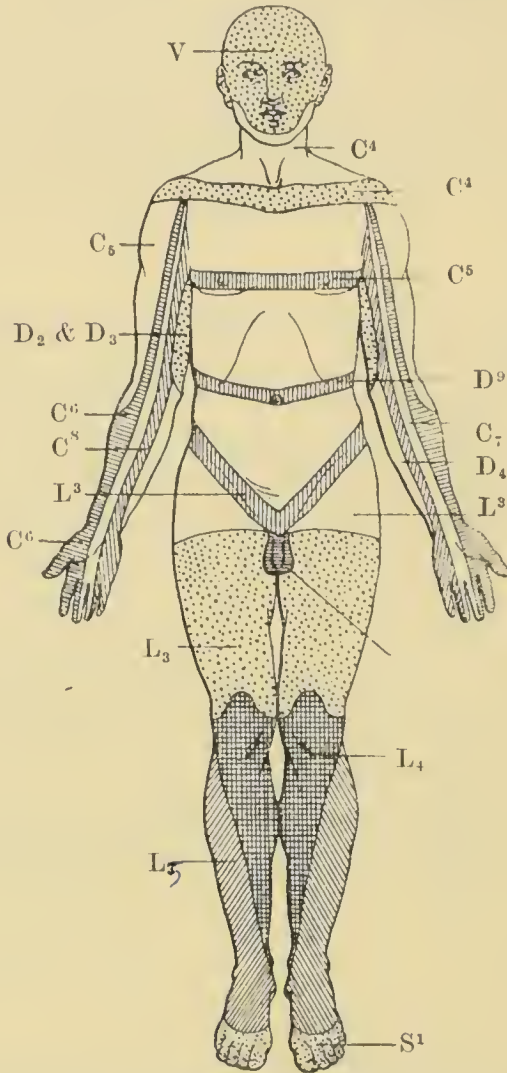


FIG. 20.—DIAGRAM OF CUTANEOUS AREAS OF POSTERIOR ROOTS.
(After COLLIER and PURVES STEWART.)

the patient suffers from girdle pain. Gurgling respirations owing to the collection of mucus in the bronchi. Meteorism is a marked feature.

Give the main Features of Fracture-dislocation of the Dorso-lumbar Region.

The area of anæsthesia reaches as high as the umbilicus. Priapism is always absent. Incontinence of urine and fæces from the first.

Describe Injury to the Lumbo-sacral Region.

The patient develops paresis of the lower extremities. A saddle-shaped area of anæsthesia is found over the buttocks,

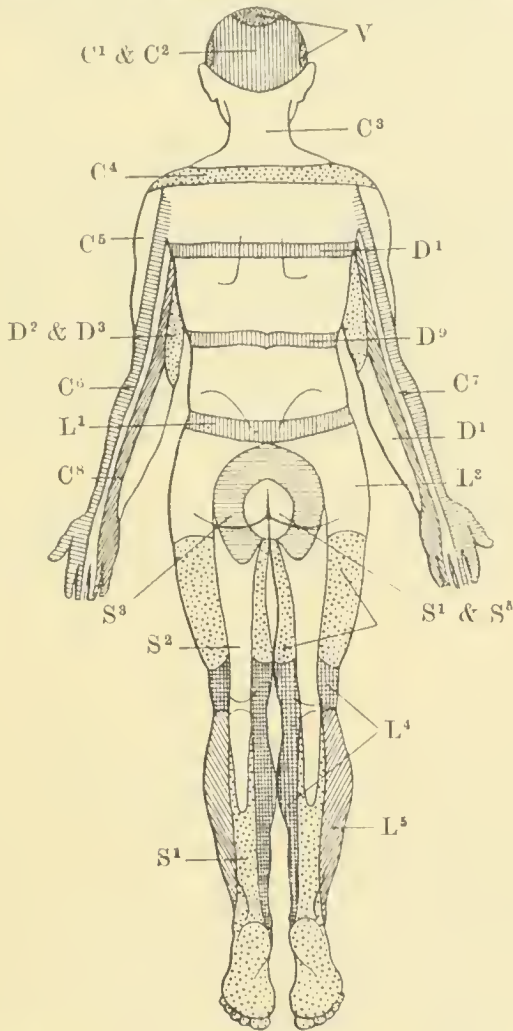


FIG. 21.—DIAGRAM OF CUTANEOUS AREAS OF POSTERIOR ROOTS.

(After COLLIER and PURVES STEWART.)

the back of the thighs, the perineum, and external genitals. Notice that both the anal canal and the urethra are insensitive; testicular sensation, however, remains. Both the bladder and the rectum are paralysed.

Indicate the Features of Injury to the Cauda Equina.

All the sacral nerves are injured, but the lumbar nerves are intact. The muscles of the lower extremity are paralysed

except the *extensors*, *adductors*, and *internal rotators* of the *hip*. Anæsthesia extends from the lower half of the buttock downwards, except the areas supplied by the femoral, lateral cutaneous, and genito-femoral ; incontinence of urine and fæces, and anæsthesia of the genital organs.

Describe Dislocation of the Spine.

Dislocation without fracture occurs only in the cervical region and follows forced lateral or forward flexion, resulting in unilateral and bilateral dislocation respectively. The lower articular process of the upper vertebra passes in front of the upper process of the vertebra below.

In unilateral cases the neck is rotated to the opposite side and flexed, and in bilateral cases is flexed, and there may be paraplegia.

The displacement is corrected by traction (manual, sling or skeletal) and extension, and plaster is applied for four months.

Describe Fracture of the Transverse Processes.

This injury occurs in the lumbar spine as the result of direct violence or violent muscular action.

The signs are acute pain on pressure and rigidity of the affected area of the spine.

In cases with little displacement the lumbar spine is strapped and after a few days exercises are begun. In cases with multiple fractures of the transverse processes with marked displacement, a plaster jacket is applied. Union by bone is unusual in cases with displacement.

THE PELVIS.

Mention the Chief Sites of Fracture of the Pelvis.

- (a) Separation of the symphysis pubis.
- (b) The anterior segment of the obturator foramen, *i.e.* through the ascending ramus of the pubes, or the conjoined rami of the ischium and pubes.

- (c) The iliac fossa.
- (d) Separation of the sacro-iliac joint.
- (e) Longitudinal fracture of the sacrum.
- (f) Separation of the iliac crest.
- (g) Separation of the anterior superior or anterior inferior iliac spines.
- (h) Fracture of the coccyx.

In addition severe displacement follows combined fractures, such as (a) with (c) or (d) and (b) with (c) or (d).

What are the Special Dangers of Pelvic Fractures ?

- (a) Shock.
- (b) Injury to the urinary tract, especially the bladder and membranous urethra.
- (c) Laceration of the vagina or rectum.
- (d) Rupture of the iliac arteries.

In cases of suspected Fracture, what is the Point of Chief Importance as regards Treatment ?

Even if no blood has escaped per urethram, the patient should not be allowed to pass water. A catheter is passed : (a) if the catheter is held up and a few drops of blood trickle from the catheter the urethra is ruptured ; (b) if a few drops of blood-stained urine escape, the bladder is probably ruptured. In this way extravasation is prevented.

What is the Treatment of Fracture of the Pelvis ?

Rupture of the urethra or bladder requires urgent operative treatment. Displacement may be corrected by lateral recumbency on the sound side and the application of plaster (Watson Jones). In cases without displacement a binder is applied tightly and the patient lies on a hard mattress. Weight-bearing is allowed after two months.

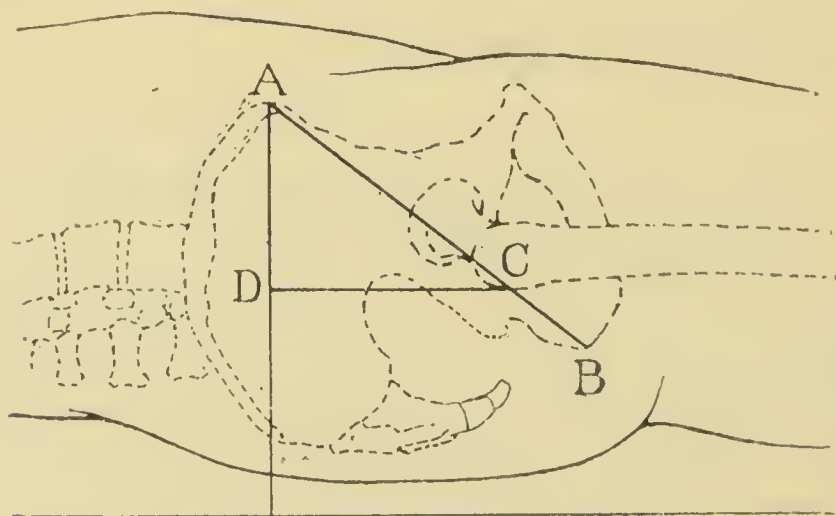
THE LOWER EXTREMITY.

HIP-JOINT.

What Special Measurements are used in investigating Injuries of the Hip-joint ?

1. **NÉLATON'S LINE.**—Draw a line from the anterior superior spine of the ilium, over the outer side of the hip, to the most prominent part of the tuberosity of the ischium ; the top of the great trochanter should touch this line in every position of the joint.

2. **BRYANT'S TRIANGLE.**—As the patient lies on his back a perpendicular is dropped from the anterior superior spine of the ilium ; then a second line at right angles to the first is drawn from the top of the great trochanter ; these two lines are then joined by a third from the anterior superior spine to the top of the great trochanter.



A B. Nélaton's Line.

A C D. Bryant's Triangle.

FIG. 22.—BRYANT'S TRIANGLE AND NÉLATON'S LINE.

3. **MORRIS'S BITROCHANTERIC MEASUREMENT.**—This is of use especially in fracture, and shows the degree of inward displacement, just as Bryant's method shows the degree of vertical displacement. The distance from the tip of the great trochanter to the symphysis pubis is measured on both sides, and the figures compared.

4. **CHIENE'S PARALLEL LINES.**—Mark the position of the anterior superior spines of the two sides, and the top of the

great trochanter on each side, and then lay two pieces of lead or tape transversely on these four points, and observe whether or not the bands are parallel with each other. This method is most useful in cases of fracture.

Name the "Regular" forms of Dislocation of this Joint.

- (a) Backwards and upwards, upon the dorsum ilii=
DORSAL.
- (b) Backwards, into the great sacro-sciatic notch=SCIATIC.
- (c) Forwards and downwards, in the obturator foramen
=OBTURATOR.
- (d) Forwards and upwards, upon the pubes=PUBIC.

The head of the femur usually leaves the joint at its lower posterior part.

How are the Posterior Dislocations caused?

When the leg is adducted, flexed, and rotated inwards, and the patient receives a blow on the back. It may also occur when a person is carrying a heavy weight and falls down, or when the patient falls from a height. The head escapes through the lower and back part of the capsule and passes in front of the obturator internus.

What are the Signs of Dislocation upon the Dorsum Ilii?

This is the most common dislocation of the hip. The leg is shortened from one to two inches, flexed, adducted, and inverted, the knee lies partly in front of the opposite thigh, and the great toe rests on the dorsum of the foot on the sound side. The joint is unnaturally rigid, and the head of the bone may be felt upon the back of the ilium under the gluteal muscles. On pressing the fingers into the groin it is found that the femoral vessels have lost their firm posterior support.

The gluteal fold is higher than normal, and the hollow behind the great trochanter is lost; the great trochanter comes to lie above Nélaton's line, and Chiene's lines are not parallel.

How does Dislocation into the Sciatic Notch differ from the above ?

The signs are very similar, but not well marked, as this dislocation is simply a less advanced form of the previous one. The head of the bone rests on the back of the ischium, a little above the level of the spine, and *below the tendon of the obturator internus*.

Describe Forward Dislocation.

Forward dislocation occurs from sudden or violent abduction when the limb is abducted and rotated outwards. The head of the femur leaves the capsule at its inner and lower part. In the obturator variety the leg is lengthened, the thigh is flexed, abducted, externally rotated, and the head of the bone can be felt under the adductor muscles resting upon the obturator externus. There may be pain from pressure upon the obturator nerve. When the bone is dislocated upon the ascending ramus of the pubes, the limb is abducted, markedly everted, and slightly shortened. Edema may result from pressure upon the femoral vein.

Describe the Method of Reduction of Dislocation of the Hip.

The patient must lie upon a firm mattress, and the appropriate manipulation is carried out under general anæsthesia. During these movements an assistant should steady the pelvis.

A. BACKWARD DISLOCATIONS.

- (a) Flex the leg upon the thigh, and the thigh upon the abdomen.
- (b) Abduct, externally rotate, and extend the hip, bringing the injured limb parallel with the sound limb. This combination of movements is termed CIRCUMDUCTION OUT.

B. FORWARD DISLOCATIONS.

- (a) Flex the knee and hip as before.
- (b) Adduct, internally rotate, and extend the hip, as before, bringing the injured limb parallel with the sound limb. These movements are called CIRCUMDUCTION IN.

Dislocation may be accompanied by fracture of the acetabular margin and there is always extensive ligamentous damage. The limb should be immobilised for six to eight weeks and thereafter weight-bearing is allowed.

FRACTURES OF THE NECK OF THE FEMUR.

How are Fractures of the Neck of the Femur divided ?

- (a) Through the narrow portion of the neck, *i.e.* INTRA-CAPSULAR.
- (b) Through the base of the neck, *i.e.* the so-called EXTRA-CAPSULAR. These fractures, however, are *within* the capsule on their anterior aspect.

Intracapsular fractures are further subdivided into (a) abduction ; (b) adduction fractures.

How are they distinguished ?

NARROW PART OF NECK.

1. *Cause*—generally slight and indirect, such as catching the foot in the carpet or slipping off the kerb-stone.
2. *Force*—usually applied longitudinally or obliquely.
3. *Age*—rarely below fifty, most commonly in feeble, aged persons.
4. *Pain and Constitutional disturbance*—slight.
5. *Crepitus*—often obscure.
6. *Shortening*—usually at first not more than one inch.

BASE OF NECK.

1. *Cause*—usually severe and direct violence, such as falling from a height, or a blow on the hip.
2. *Force*—usually applied transversely.
3. *Age*—usually below fifty, chiefly in vigorous adults.
4. *Pain and Constitutional disturbance*—usually considerable.
5. *Crepitus* (when not impacted) very readily felt.
6. *Shortening*—(when not impacted) at least two inches or more.

| NARROW PART OF NECK. | BASE OF NECK. |
|---|---|
| 7. <i>Impaction</i> —rare. | 7. <i>Impaction</i> —common. |
| 8. No apparent injury to soft parts about the hip. | 8. Considerable extravasation, ecchymosis, and signs of direct injury to hip. |
| 9. Moderate external rotation deformity. Not over 45 degrees. | 9. Extreme external rotation 90 degrees. |
| 10. X-ray shows site of fracture. | |

What are the Differences between Abduction and Adduction Fractures?

In *abduction fracture* the bone is broken by forced abduction and the lower fragment becomes slightly abducted on the upper one and solid impaction occurs. The axis of weight-bearing produces further impaction. In *adduction fractures* the converse is true, there being no impaction and the axis of weight-bearing producing separation of the fragments.

What is the Treatment of Fracture of the Neck of the Femur?

EXTRACAPSULAR FRACTURES.—Owing to the displacement, traction is essential to reduce the deformity and is applied with the limb abducted. Later the limb may be immobilised in plaster. Operative fixation is advised by some surgeons.

ABDUCTION INTRACAPSULAR FRACTURES.—No prolonged treatment is necessary as the fracture tends to unite. Rest in bed, followed by the application of a short walking hip plaster spica is sufficient.

ADDUCTION INTRACAPSULAR FRACTURE.—Treatment must depend on the condition of the patient: (a) the fracture is reduced by manipulation and internal fixation is secured by the insertion of a Smith-Peterson three-flanged nail; (b) the fracture is reduced and maintained in position by a Whitman plaster in abduction and full internal rotation; (c) traction may be applied to correct the deformity, sub-

sequently a plaster spica is applied for 12 weeks and thereafter a walking caliper splint is worn.

Non-union is liable to result from all except the first method.

Aseptic necrosis of the head of the femur is a frequent complication and is a common cause of non-union.

FRACTURES OF THE SHAFT.

Give a Short Account of Fractures of the Shaft of the Femur.

They are very common in children, and may be of the greenstick variety. In adults the fracture is usually oblique, being caused by indirect violence—the bone giving way about its middle or weakest point. It may be broken :—

1. BELOW THE LESSER TROCHANTER.—In this case the upper fragment is tilted forwards and everted by the ilio-psoas, the external rotators, and the gluteal muscles. The lower fragment is drawn upwards behind the upper by the rectus femoris and hamstrings ; inwards by the pectineus and adductors, and rotated outward by the weight of the limb.

2. JUST ABOVE THE MIDDLE OF THE SHAFT.—The direction of the fracture is downwards, forwards, and inwards. The displacement is similar to that of the fracture below the lesser trochanter. Shortening may vary from one to four inches.

3. SUPRA-CONDYLAR FRACTURE OF THE FEMUR.—This fracture may be brought about by direct violence, or by falls upon the knees or feet. The *upper fragment* moves slightly forwards, while the *lower fragment* is pulled backwards by the gastrocnemius, plantaris, and popliteus muscles. The leading clinical features are :—(a) effusion into the knee joint ; (b) on flexing the knee, crepitus is usually obtained ; (c) shortening of the thigh about one inch ; and (d) signs of rupture of the popliteal artery, or of pressure upon the popliteal vein or nerves, may be observed.

What is the Treatment?

FRACTURES OF THE SHAFT owing to (a) the displacement, (b) the great bulk of the thigh muscles, require traction methods for their reduction and immobilisation. The following methods are in common use :

- (a) Skin traction in Thomas splint.
- (b) Skeletal traction by $\left\{ \begin{array}{l} (1) \text{ Kirschner's wire} \\ (2) \text{ Böhler's pin} \end{array} \right\}$ through the lower end of the femur or tibial tuberosity. The limb may be placed in a Thomas or Braun-Böhler's splint.
- (c) In young children vertical extension on a gallows splint.

Traction methods require from 15 to 30 lbs. weight extension, which should be reduced when the position is satisfactory. Traction may be retained until union is sufficient for a plaster to be safely applied. When union is secure, weight-bearing may be resumed in a walking caliper splint, but in the young this is usually unnecessary.

SUPRACONDYLAR FRACTURES are reduced by traction with the knee flexed. Control of the lower fragment is obtained by skeletal traction through the condyle of the femur or tibial tuberosity and the limb is put up in a Thomas splint with knee flexion piece or on a Braun-Böhler frame, the angle of which lies immediately behind the site of fracture.

T or Y shaped fractures may also be reduced by this method, but operative reduction may be required.

Describe Separation of the Lower Epiphysis of the Femur.

This injury most frequently occurs in boys between the ages of thirteen and eighteen. The chief causes are :—

- (a) Hyper-extension of the knee ; and
- (b) Wrenching forms of violence.

In the majority of cases the epiphysis passes forwards, and the smooth inferior extremity of the diaphysis can be palpated in the popliteal space. The lower fragment is tilted by the gastrocnemius and there is danger of compression of the popliteal vessels by the upper fragment.

The knee joint is flexed to relax the calf muscles and the displaced epiphysis is reduced by traction and pressure. The knee is put up in plaster in right-angle flexion. A new plaster with the knee less fully flexed is applied after three weeks until union is solid.

KNEE JOINT.

Describe Dislocation of the Patella.

Lateral dislocation is the most common owing to the slope of the quadriceps extensor, which passing distally and medially, makes an angle with the ligamentum patellæ. When, therefore, the quadriceps is suddenly brought into play, it tends to assume a straight line with the ligamentum patellæ, and jerks the patella laterally.

The usual causes are sudden muscular contraction, especially in those with genu valgum ; or a blow on the inner side of the patella during extension. The patella comes to lie on the outer surface of the lateral condyle.

Spontaneous reduction may occur when the diagnosis rests on the history and on the effusion into the joint. The dislocation is reduced by flexing the thigh and extending the knee to relax the quadrieeps.

The quadriceps is then restored by exercises. Recurrent dislocation may require transplantation of the tibial tubercle, the lateral half of the ligamentum patellæ or the elevation of the lateral condyle by a bone graft.

Describe Fracture of the Patella.

Fracture may be due to (1) direct violence, when the knee is flexed ; in this case the fracture may be comminuted, vertieal, stellate, etc. : (2) muscular action, as, when the patient slips backwards, and to save himself from falling, throws the quadriceps suddenly into action. The patella then snaps in the same way that a stick is broken across the knee. The patient falls, *because* the patella is broken : it is not the fall that breaks it. This form of fracture is always

TRANSVERSE, and opens into the joint as well as into the prepatellar bursa, hence the great effusion into the joint. The site of fracture is at the junction of the middle and lower thirds of the bone, and the periosteum tears at a slightly lower level.

The limb is useless, as the patient cannot extend his leg. Both the knee-joint and the supra-patellar bursa are distended with fluid. The fragments may be separated for a considerable distance, and the upper fragment may become adherent to the femur.

Give the Treatment.

To avoid subsequent chronic arthritis there must be no roughness of the articular surface. The skin is prepared and the patella is held in position by (*a*) suture of the periosteum ; (*b*) surrounded by catgut ; or (*c*) a catgut suture is passed through drill holes in the bone. If complete reduction is impossible, the patella is excised and the quadriceps is sutured.

Describe Sprains and Ruptures of the Lateral Ligaments.

The internal (tibial) lateral ligament is frequently injured in abduction strains of the joint, but a similar injury of the external (fibular) lateral ligament is uncommon.

The diagnosis is made by (*a*) the history, (*b*) local tenderness, (*c*) pain locally on abducting the knee, (*d*) effusion into the joint.

In rupture of the ligament the signs are more marked and in addition abnormal mobility is present.

Sprain is treated by the firm application of a bandage and quadriceps exercises. Raising of the inner side of the sole and heel prevents strain on the ligament.

Rupture of the ligament demands eight weeks immobilisation in plaster, and other associated injuries such as fracture of the tibial spine, injury of the medial cartilage or rupture of the cruciate ligaments must be excluded.

Describe Rupture of the Cruciate Ligaments.

This injury follows severe twisting violence and is usually associated with rupture of the internal lateral ligament. The anterior, posterior or both cruciate ligaments may be torn or the violence may result in fracture separation of the tibial spine. The clinical features are (a) marked swelling, (b) severe pain, (c) anterior mobility of the flexed tibia on the femur in ruptures of the anterior ligament and posterior mobility in those of the posterior ligament, (d) signs of rupture of the internal lateral ligament, (e) X-ray may show fracture of the tibial spine.

Treatment is immobilisation in plaster for three months to allow healing to take place. In late cases instability of the joint demands treatment and reconstruction of the ligaments by fascia lata may be carried out.

Describe Dislocation of the Knee Joint.

This injury results from severe twisting forms of violence which rupture the ligaments and allow the tibia to be displaced forwards, backwards or laterally on the femur. The lateral and cruciate ligaments are torn and there may be damage to the other intra-articular structures.

The diagnosis is obvious from the deformity, abnormal mobility and swelling, and reduction by manual traction is usually simple. The joint is then immobilised in plaster for three months at least to allow healing of the ruptured ligaments to take place.

What are the Anatomical Features of Importance in the Surgery of the Menisci (Semilunar cartilages) ?

The lateral meniscus is almost circular in shape with the attachments of its two horns close together one behind and the other in front of the tibial spine. The medial meniscus is semilunar in shape, the attachments of the horns overlapping those of the lateral one. The lateral cartilage is separated from the external lateral ligament by the tendon of the popliteus, whereas the posterior part of the medial meniscus is firmly attached to the internal lateral ligament and the anterior portion is relatively freely moveable.

The menisci move with the tibia on the femur in flexion and extension of the knee and if the joint is slightly flexed rotation of the tibia can occur, the movement taking place between the tibia and the menisci.

Describe Rupture of the Medial Meniscus (Cartilage).

The medial cartilage is injured as the result of a torsion injury of the joint, the essential mechanism being an internal rotation of the femur on the fixed tibia. The injury results in (a) separation of the cartilage from its peripheral attachments or a longitudinal split (bucket handle tear), (b) separation of the anterior horn, (c) separation of the posterior horn, and (d) transverse rupture of the cartilage at the site of its attachment to the internal lateral ligament.

Following the accident the limb becomes useless and the knee locks in semiflexion. Effusion occurs and the signs on examination are (a) fluid in the joint, (b) loss of full extension, (c) tenderness over the cartilage. If, however, the cartilage is not displaced there are the signs of traumatic synovitis only. Following manipulation locking is relieved and healing may take place, but the more likely sequel is weakness of the joint with attacks of locking and synovitis. The diagnosis rests on the history, perhaps some limitation of full extension, tenderness over the cartilage in anterior and posterior horn lesions and M'Murray's sign. The tibia is fully flexed on the femur and is then rotated and abducted and adducted, a click being produced in tears of the posterior horn. If the tibia is now held fully abducted and externally rotated on the femur and the knee is gradually extended, a hand on the front of the joint will feel a click which may be audible as the torn cartilage passes between the bones. The nearer full extension the click occurs, the nearer the front of the cartilage is the tear.

Treatment is excision of the affected meniscus.

THE LEG.

Describe Fractures of the Upper End of the Tibia.

Fracture of the tibial spine has already been described along with injuries of the crueiate ligaments. Oblique

fracture of either condyle of the tibia follows valgus and varus strain of the knee, the condyle of the femur impinging on the tuberosity and causing a depressed fracture or shearing it from the bone. Associated with the fracture there is usually severe injury to the ligaments of the knee.

Diagnosis on clinical grounds is impossible, the only positive sign being X-rays which also show the extent of the displacement. The displacement is corrected by traction and compression or by operation, and the limb is kept immobilised in plaster for ten to twelve weeks.

Describe Fractures of the Shafts of the Bones of the Leg.

These fractures are frequently compound because of the subcutaneous position of the tibia. The wound is caused either by the force which broke the bone (fracture by direct violence) or by the passage of one of the bony fragments through the skin in fracture by indirect violence. In the first case the fracture is compound from without and in the second, compound from within. In fracture by direct violence the bones break transversely at the point of impact, whereas following indirect violence the bones give way at their weakest points (lower third of tibia, upper half of fibula) and the line of fracture is oblique from behind downwards, forwards, and inwards.

What is the Usual Displacement ?

If only one bone is broken the displacement is slight as the sound bone acts as a splint. There is little displacement also as a rule in simple transverse fractures. In oblique fractures of both bones the lower fragment of the tibia is drawn upwards and pulled backwards by the muscles of the calf (gastrocnemius, soleus). The heel is drawn upwards and the toes are pointed ; the weight of the foot also tends to rotate it laterally. The upper fragment is tilted forwards by the ligamentum patellæ and rotated medially by the sartorius, gracilis and semitendinosus.

What are the Difficulties in Treatment ?

Swelling may be severe when the patient is first seen and as it subsides rapidly after reduction, redisplacement may

occur inside the plaster. Mobility after reduction often makes traction methods necessary and union is often slow because of the poor blood supply.

What are the Clinical Features ?

All the signs of fracture are present and are easily elicited because of the proximity of the tibia to the surface. Care in handling is essential lest the fracture be made compound.

What is the Treatment ?

Fracture of the shaft of the tibia frequently occurs in children, the line of fracture being oblique and the displacement minimal. The leg is immobilised in plaster for six weeks.

In cases with little displacement the patient is anaesthetised and the knee is flexed to a right angle and the leg hangs over the edge of the table. Plaster is applied after the lateral and rotational displacement is corrected manually.

In cases with greater displacement and mobility after reduction a traction method is preferable, *e.g.* Böhler's frame. A pin is passed through the os calcis or through the lower shaft of the tibia. After over-riding is corrected the fracture is moulded into position by hand and plaster is applied to incorporate the pin. The plaster is supported on a Braun-Böhler splint and traction on the pin is continued to prevent redisplacement in plaster.

Compound fractures following complete excision of the wound are treated in the same way.

THE ANKLE.

Describe Sprain of the Ankle Joint.

Sprain of the ankle joint follows twisting violence applied to the foot. Abduction and external rotation of the foot result in sprain of the tibial collateral ligament, but the most common injury is sprain of the anterior band of the fibular

collateral ligament which follows adduction and internal rotation strains of the foot.

The clinical features are sudden severe pain localised over the affected ligament, swelling and bruising but no deformity, and the bony points are in normal relationship. X-ray is necessary to exclude fracture without displacement and is better carried out in full abduction or adduction to exclude complete tear of the ligament.

Treatment is to strap the ankle and encourage movement, the injection locally of novocaine is of value. Should the ligament be torn the ankle must be immobilised in plaster. Raising of the appropriate side of the sole will prevent undue strain on the ligament during recovery.

Describe Dislocation of the Ankle.

Dislocation of the talus (astragalus) can only occur backwards or forwards without fracture of the malleoli. Upward dislocation is also described and can only follow rupture of the inferior tibio-fibular ligament. The relationship of the talus to the tarsus is not affected.

The clinical features are :—*Posterior dislocation*—(a) the foot is shortened ; (b) the heel is prominent ; (c) the lower ends of the leg bones form a projection anteriorly. *Anterior variety*—(a) the foot appears lengthened ; (b) the heel is shortened ; (c) the sulci lateral to the tendo Achilles are obliterated.

Reduction under general anæsthesia is usually easy and the ankle is immobilised at right angle flexion in a walking plaster for six to eight weeks. Dislocation of the ankle is rare.

Classify Fractures of the Ankle.

| | |
|--|---|
| ABDUCTION FRACTURES—the result of for- | } Pott's fracture. Dupuytren's fracture. |
| cible abduction, | |
| eversion, and ex- | |
| ternal rotation of | |
| foot. | |

ADDUCTION FRACTURES—due to adduction, inversion, and internal rotation strain of the foot.

Describe Abduction Fractures.

The abduction and eversion strain of the foot causes traction on the inner side of the ankle joint with fracture of the deltoid ligament or medial malleolus. The talus impinges on the lateral malleolus and the strong tibio-fibular ligament usually remains intact and acts as the fulcrum about which the force acts and the fibula breaks either just above the base of the malleolus or above the ligament. This is a Pott's Fracture which may be classified into three degrees. *First Degree*—fracture of the lateral malleolus without displacement; *Second Degree*—fracture of lateral malleolus with rupture of deltoid ligament or fracture of the medial malleolus and lateral dislocation of the talus; *Third Degree*—same as the second degree with the addition of posterior marginal fracture of the tibia and posterior as well as lateral dislocation of the talus (Watson Jones). Should rupture of the inferior tibio-fibular ligament occur the third degree fracture may be complicated by upward displacement of the talus between the separated tibia and fibula—*Dupuytren's fracture*.

What are the Clinical Features ?

In cases without displacement there may be only pain and local tenderness over the lateral malleolus and the patient may be able to walk. In more severe cases the characteristic attitude is eversion of the foot which is displaced backwards. The toes are pointed and there is prominence of the medial malleolus. The usual signs of fracture are present and the tenderness is found over the medial malleolus, deltoid ligament, inferior tibio-fibular ligament and the site of fracture of the lateral malleolus. Swelling and bruising of the soft parts are frequently marked.

Describe Adduction Fractures.

This is a much less common injury than the abduction one and is classified on similar lines: *First Degree*—fracture of both malleoli without displacement of the talus. The malleoli break at the level of the lower articular surface of

the tibia. *Second Degree*—the fracture of the medial malleolus includes part of the lower surface of the tibia and the talus is displaced medially.

What is the Treatment?

In *abduction fractures* without displacement the foot is put up in a skin-tight plaster at right-angle flexion with inversion. A Böhler's walking iron allows weight-bearing and facilitates recovery of function. If displacement is present, reduction under anæsthesia is carried out with the knee flexed to relax the tendo Achilles and the foot is fully inverted at right-angle flexion and is brought forwards to correct the posterior displacement. Plaster is again applied. In cases with marked swelling it is safer to split the plaster, elevate the limb, or apply a splint until the swelling has subsided, when a skin-tight plaster is again applied. *Adduction fractures* are put up with the foot everted. The plaster is kept on until union is secure, *i.e.* 6 to 8 weeks. Reduction should be perfect, otherwise arthritis of the ankle will develop.

Describe Fracture of the Calcaneus (Os Calcis).

Fracture of the calcaneus follows falls on to the feet, and though usually the result of falls from a height quite trivial injuries may cause fracture. The fracture may be a crack or a separation of the upper part of the tuberosity or a severe crush injury of the bone. Crush fracture results from the squeezing of the bone between the ground and the body weight transmitted through the talus. There may be no very obvious clinical signs. The patient is not able to walk, the heel is broadened laterally and shortened from above downwards, there is bruising of the soft tissues of the heel and the tenderness is limited to the outline of the bone.

The diagnosis depends on X-ray examination, and in addition to the two routine views an oblique plantar dorsal view should be taken and compared with a similar view of the other side in doubtful cases. A useful index is the salient or tuber-joint angle described by Böhler: on the lateral X-ray a line is drawn from the highest point of the calcaneus to the highest point of the anterior angle and a second line

from the highest point to the superior angle of the tuberosity meets the first at an angle of about 140 degrees. This obtuse angle is difficult to measure visually and the complementary angle of 40 degrees is usually employed. The angle is reduced or even reversed in fracture of the calcaneus.

Describe the Treatment.

Fractures without displacement are immobilised in plaster and walking on the plaster is begun at once. After six to eight weeks the plaster is removed and walking can be begun.

In severe crush fractures the displacement may be reduced by traction by means of a Böhler's pin through the upper part of the tuberosity and by forcible compression of the bone by means of a clamp. Plaster is applied and must be retained for three months or more before weight-bearing is begun.

The results of fractures of the calcaneus are not good and arthritis of the subtaloid and mid-tarsal joints is a common sequel.

DISEASES OF JOINTS.

Define the more common Terms employed in describing Joint Diseases.

Synovitis—An inflammation of the synovial membrane ; it is usually accompanied by an effusion of fluid into the joint.

Hydrops—A chronic serous synovitis in which effusion is the salient feature.

Arthritis—An inflammation of all the tissues of the joint, which may be acute, subacute or chronic.

Ankylosis—Loss of movement in a joint due to the fixation of the articular surfaces to each other. The ankylosis may be *fibrous, cartilaginous or bony*.

Arthrodesis—An operation to fix and stabilise a flail or painful joint.

Arthroplasty—An operation designed to restore movement in an ankylosed joint.

Varus—A varus deformity is a lessening of the angle on the medial side between the component bones of a joint.

Valgus—The opposite deformity to varus, *i.e.* a decrease in the angle between the bones on the lateral side of the joint. Example may clarify this: genu valgum is knock knee and genu varum is bow leg.

What are the Causes of Limitation of Movement in a Joint?

- (a) Paralysis of muscle.
- (b) Muscular spasm.
- (c) Contracture of the skin and soft tissue, *e.g.* after burns.
- (d) Shortening and contracture of muscles and ligaments.
- (e) Locking due to loose bodies or displaced intra-articular structures.
- (f) Ankylosis.
- (g) Chronic arthritis.

PYOGENIC DISEASES.

Describe Acute Arthritis.

Acute arthritis follows infection of the joint by the staphylococcus and streptococcus chiefly, but it also is caused by the typhoid bacillus, pneumococcus and gonococcus. The infection may reach the joint by the blood stream, from a focus in the bone or possibly from a penetrating injury. The synovial membrane is acutely inflamed and there is an outpouring of fluid which is at first serous but quickly becomes purulent. The inflammation spreads to the cartilage which becomes eroded and is also separated from the bone by the undermining of it by granulation tissue. As the disease affects all the tissues of the joint, the capsule and ligaments are involved and pathological dislocation may occur, *e.g.* hip in infants.

The disease frequently begins with a rigor, the temperature is raised, the pulse quickened and the constitutional signs are marked. Locally the joint is flexed, held rigid, hot and swollen. Pain is severe and is aggravated by the slightest movement of the limb. The swelling shows itself

between bony prominences where the synovial membrane is least supported.

X-ray in the early stages shows only widening of the joint line, and by the time destruction of the bone is obvious the diagnosis is not in doubt.

In the early phase aspiration may be necessary to establish the diagnosis.

What are the possible Terminations of Acute Arthritis?

- (a) Resolution with only slight impairment of joint function.
- (b) Fibrous or bony ankylosis.
- (c) Contracture deformity.
- (d) Death from septicæmia or long-standing suppuration and amyloid disease.

What is the Treatment?

- (a) General constitutional measures as in septicæmia (Part I).
- (b) Support the limb and apply gentle traction to ease the pain and separate the joint surfaces.
- (c) In early cases aspirate the joint. If pus is present drain the joint.
- (d) Sulphanilamide or sulphapyridene are of value in streptococcal cases.
- (e) Amputation may be necessary to save life.

Describe Pneumococcal Arthritis.

This infection is a complication or sequel of pneumonia and may affect a single large joint or may be an incident in a pneumococcal septicæmia. In young children the arthritis may be so insidious that the first sign is pathological dislocation. In adults there is gross destruction of bone and ankylosis is the usual result. The diagnosis is made from acute arthritis by the history and by the bacteriological examination of the fluid.

Treatment is that of acute arthritis plus the administration of sulphapyridene.

Describe Gonorrhœal Affections of Joints.

The infection reaches the articular system from the primary focus by the blood stream and may occur in the acute or chronic stage of the urethritis which is often apparently mild. The joints most commonly involved are the knee, elbow, ankle and wrist. There are four clinical types :—

- (a) Dry polyarthrititis.
- (b) Hydrops—the most frequent manifestation.
- (c) Acute synovitis.
- (d) Suppurative arthritis. Osseous ankylosis usually follows this variety.

The arthritis may be so mild that the only symptom is pain passing from joint to joint or there may be a painful effusion from which the gonococcus can be isolated.

Treatment is directed to the urethritis and otherwise the measures for acute arthritis apply.

Describe Tuberculosis of Joints.

Tuberculous disease of joints chiefly affects the young but also occurs in adults. The infection reaches the joint by the blood stream or it may follow the rupture of an osseous focus into the joint. The disease attacks all the tissues of the joint and the pathological changes are :—

- (a) *Synovial membrane*.—This becomes thickened and undergoes gelatinous degeneration. The sub-synovial fat increases in amount.
- (b) *Articular cartilage*.—The affected synovial membrane may either invade the superficial or the deep aspect of the cartilage. In the former case the cartilage fibrillates ; in the latter, it is lifted off the bone in patches—necrosis of cartilage.
- (c) *Bones*.—The marrow undergoes fibro-myxomatous degeneration and the articular surfaces show caries.
- (d) *Ligaments*.—The ligaments become softened and vascularised, hence pathological dislocation may occur.

(e) *Soft parts*.—The superficial tissues and skin are pale and swollen. In advanced cases typical tuberculous sinuses may be present.

(f) *Arteries*.—The neighbouring arteries show endarteritis and periarteritis.

One or other of these features may dominate the picture and four types of tuberculous arthritis are recognised clinically :—(1) *White swelling*, or diffuse thickening and degeneration of the synovial membrane and the periarticular tissues. (2) Chronic synovitis or *Tuberculous hydrops*. (3) Pus may fill the joint—*Tuberculous empyema*. (4) Caries of the articular surfaces and the formation of abscesses and sinuses—*Tuberculous arthritis*.

What are the Clinical Features ?

The *early signs* are (a) insidious onset, (b) limitation of movement, (c) pain which is more of an ache, (d) in the lower limb a limp and (e) swelling of the joint may be noted.

Later there is pain due to the increased tension, the joint takes up the position of greatest capacity and there is marked limitation of all movements due to muscle spasm. The muscles show wasting. At this stage X-ray will show the soft tissue swelling and rarefaction of the bones.

Finally, there will be gross signs due to destruction of the cartilage and bone. Starting pains at night, shortening of the limb, deformity and even tuberculous sinuses.

What is the Treatment ?

(a) General treatment as previously described.

(b) Local treatment aims at correcting the deformity due to muscle spasm and the immobilisation of the joint until healing is complete both clinically and radiologically.

(c) Surgical treatment may be employed in the later stages to arthrodesis joints which have only a limited range of painful movement, but the operation of excision has largely been replaced by conservative measures. Amputation may be required to save life in cases in which secondary infection has occurred.

Describe Syphilitic Disease of Joints.

In children a painless synovitis of the knees due to gummatous change is commonly known as Clutton's joints. Other joints are less often affected and the main feature is the trivial disability and the disease is bilateral. Stigmata of congenital syphilis are present. In secondary syphilis, fleeting pains occur in the joints without obvious pathological or clinical changes and bilateral effusion of the knee joints also occurs.

In the later stages of the disease arthritis resembling tubercle may occur.

Describe Arthritis Deformans.

The disease occurs in two main forms (a) hypertrophic rheumatoid or chronic infective arthritis and (b) atrophic arthritis, degenerative or osteoarthritis. Rheumatoid arthritis occurs most frequently in females below the age of forty and affects the smaller joints in its initial stages and is usually bilateral. Osteoarthritis usually affects one joint and is usually found in males of a later age period.

Describe the Clinical Features of Rheumatoid Arthritis.

The onset of the disease is usually gradual but in some cases is acute. The small joints of the hands and feet become swollen and painful and the spindle-shaped swelling is accentuated by the atrophy of muscle. Later the larger joints are involved and flexion deformity occurs. The general health is poor and during the active stage there is pyrexia. Symptoms tend to subside for a time only to be followed by another exacerbation which results in still further fibrosis and deformity.

During the active stage the patient is confined to bed and any focus of sepsis is eradicated and deformity is prevented by splinting.

In the later stages deformity may require correction by wedge plasters or by operation.

Describe Osteoarthritis.

Osteoarthritis occurs chiefly in the knee and hip joints frequently as the result of faulty alignment following

fracture or deformity. The pathological changes are fibrillation of the central portion of the articular cartilage and the active growth at its extremities of nodules which ossify—*osteophytes*. Ossification occurs around the periphery of the capsular ligaments—*lippling*, and there is sclerosis and polishing of the articular surface—*eburnation*.

The patient, usually a middle-aged man, complains that the joint becomes stiff after resting and loosens with exercise. Vague pains worse in damp weather and creaking on movement are the main features. There may be some excess of fluid in the joint and tenderness over the edges of the articular cartilage.

X-ray examination reveals at first merely narrowed joint space due to the destruction of the cartilage and later lippling and osteophytes. Wasting of muscle follows from disuse and movement becomes restricted.

Treatment in the early stages is by radiant heat and diathermy with exercises to improve the muscle tone. Later, painful joints with a limited range of movement may require arthrodesis to relieve the pain. The separation of an osteophyte may result in loose body formation or the presence of loose bodies may have caused the arthritis and these may require surgical removal.

Mention the Varieties of Loose Bodies found in Joints.

(a) *Fatty* tags as in arborescent lipoma.

(b) *Fibrinous*—often known as melon seed bodies. They occur as the result of trauma and in tuberculous disease.

(c) *Cartilaginous*. These may follow the separation of a synovial chondroma into the joint and may be single or multiple.

(d) *Osteo-cartilaginous*. Mixed bony and cartilaginous loose bodies may be caused by :

(1) trauma, *e.g.* medial epicondyle.

(2) trauma in abnormal joint, *e.g.* separation of an osteophyte.

(3) osteochondritis dissecans.

In addition trauma may cause the separation of normal intra-articular structures, *e.g.* the menisci which give rise to similar symptoms. The symptoms are intermittent synovitis

and locking of the joint in flexion and sometimes the loose body may be felt moving in the joint or may lie so superficially that the patient can palpate it. The loose body should be removed before osteoarthritis develops.

Describe the Common Injuries to which Joints are Liable.

(a) *Sprain*—A sprain is the name given to a stretching or partial tear of the capsule or ligaments of a joint as the result of movement beyond its normal range. The sprain causes acute pain and there is hæmorrhage into the joint and between the ligament and the synovial membrane. The violence may rupture the ligament or may detach it along with a flake of bone. The clinical features are pain and tenderness over the affected ligament and on putting it on the stretch, swelling and loss of function but no deformity. Treatment aims at giving support to the injured ligament with the earliest possible return to activity to prevent the development of adhesions. Complete rupture of the ligament must always be remembered and excluded before treatment is begun.

(b) *Rupture of Ligaments*—Rupture of a ligament follows greater violence than a sprain. The features are similar with the addition of abnormal mobility. Treatment is directed towards healing of the ligament without stretching and this requires the immobilisation of the joint with the affected ligament relaxed in plaster.

(c) *Dislocations* of the larger joints have been described individually. Dislocations may be complete or partial, *i.e.* a subluxation in which the bones are still within the capsule but have lost their normal relationships. It must be remembered that dislocation or subluxation can only occur if the ligaments of the joint have been stretched or ruptured. Pathological dislocation occurs with minor degrees of violence or spontaneously in a diseased joint, *e.g.* in Charcot's disease and acute arthritis.

(d) *Traumatic Synovitis*—This is the term given to a serous or blood-stained effusion into a joint following an injury. It is present in sprains and other ligament injuries and also in internal derangements and fractures of the articular surfaces, but it also follows an injury in which no other lesion can be found. The joint becomes greatly

swollen and tense and is held in flexion to relieve the pain. Tenderness and rise of local temperature are found over the joint. All the other joint injuries should be excluded and an X-ray taken before the diagnosis is finally made. Treatment is to rest the part and to apply pressure by a bandage over wool and keep the muscles in satisfactory tone by active exercises. Active movement should be begun as soon as possible to try to prevent the development of adhesions.

(e) *Penetrating Wounds*—Sharp instruments and fragments may cause penetrating wounds of joints. Infection is liable to endanger life and limb unless the treatment is carried out early and thoroughly. The wound must be completely excised as in compound fractures, all the devitalised and infected tissue being removed. A drain may be inserted to the opening in the capsule after closing the joint, or in early cases the wound may be closed and plaster applied. The joint is kept splinted until all danger of infection has subsided. Should infection occur the features are those of acute arthritis and the treatment has already been described.

How would you Aspirate the larger Joints of the Limbs?

Shoulder—Pass the needle backwards, upwards, and laterally from a point immediately below the lateral margin of the tip of the coracoid process.

Elbow—With the joint flexed to 90° pass the needle from the posterior surface just above the head of the radius.

Wrist—The needle is inserted into the joint just below the ulnar styloid process.

Hip—The hip may be aspirated from the front by passing a needle backwards, upwards, and inwards from a point $2\frac{1}{2}$ ins. distal to the medial side of the anterior superior iliac spine.

Knee—The needle may be passed on either side of the ligamentum patellæ just distal to the patella or directly into the suprapatellar pouch.

Ankle—The joint is aspirated from the front, either on the medial side between the tibialis anterior and the medial malleolus, or on the lateral side between the lateral malleolus and the extensor digitorum longus.

CATECHISM SERIES

SURGERY

PART III

FIFTH EDITION

REVISED AND REWRITTEN

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SURGERY

PART III

THE ABDOMINAL WALL AND PERITONEUM.

Describe Tumours of the Abdominal Wall.

(a) *Lipomata*.—These tumours may arise in connection with either the superficial fascia (subcutaneous) or the extra-peritoneal fat.

(b) *Fibromata*.—As in other regions of the body, both hard and soft varieties are met with. Multiple forms spring from the sheaths of the cutaneous nerves in Von Recklinghausen's disease.

(c) *Recurrent Fibroids*.—The desmoid tumour of Paget arises from the rectus sheath and spreads along the lines of least resistance as a flattened and ultimately extensive cellular fibroma. It has no true capsule and is very liable to recur even after apparently complete removal.

(d) *Malignant*.—Secondary carcinoma and sarcoma occur.

(e) *Dermoids*.—These cysts are occasionally found in the neighbourhood of the umbilicus.

How would you classify Wounds and Injuries of the Abdomen ?

(a) *Wounds of the Abdominal Parietes*.—These wounds are described as *penetrating* if they involve the peritoneal cavity and *non-penetrating* if the peritoneum is not perforated. A penetrating wound may be followed by immediate visceral protrusion.

The type of injury by a blunt form of violence causing no actual wound of the abdominal wall is of great importance, for it may cause (1) contusion and/or hæmatoma of the abdominal wall, (2) rupture of the rectus muscle, (3) rupture of a blood vessel, *e.g.* inferior epigastric, (4) rupture or

contusion of a hollow viscus, (5) rupture or contusion of a solid organ.

(b) *Wounds of the Abdominal Viscera*.—(1) Without protrusion, (2) with protrusion and hence the wounds may be classified into—

- | | | |
|-----------------|---|---|
| Penetrating | { | (i) Through the abdominal wall alone. |
| | | (ii) With protrusion of viscera. |
| | | (iii) With protrusion and wound of viscera. |
| | | (iv) With wound of viscera without protrusion. |
| Non-penetrating | { | (v) Intraperitoneal rupture of viscus without external wound. |
| | | (vi) Extra-peritoneal rupture of viscus without external wound. |

What is the Treatment of Penetrating Abdominal Wounds ?

The wound must be explored under the best possible conditions and (a) if the peritoneal cavity is not involved, treated by excision as described in Part I ; (b) if the peritoneal cavity is involved a thorough examination is carried out of all the viscera, rents in omentum or mesentery are closed, small perforations of intestine invaginated and larger ones treated by resection. Remember multiple wounds are frequent.

How would you differentiate between Contusion of the Abdominal Wall and Rupture of a Viscus ?

Rupture of a solid viscus such as the liver or spleen presents the typical features of internal hæmorrhage and is described under that heading elsewhere. The differentiation between contusion of the abdominal wall and associated rupture of a hollow viscus is one of the most difficult in all surgery. Contusion of the abdominal wall may cause some degree of shock, there is tenderness over the injured area, but rigidity is absent. Under observation vomiting does not persist and the pulse rate does not rise. If visceral injury has occurred the pain is persistent, vomiting may occur and there is deep tenderness with local muscle guarding and later rigidity. Under observation vomiting or rising

pulse are of great significance and a straight X-ray may afford valuable information by showing the escape of gas into the peritoneal cavity.

Treatment is immediate laparotomy in all cases of definite or likely rupture of a hollow viscus. It is better to operate early and find no rupture than to wait until the diagnosis is certain.

Describe Meckel's Diverticulum.

In early embryonic life a communication is found between the primitive alimentary tube and the yolk-sac. This channel is termed the vitelline duct. It arises from the ileum usually, about $2\frac{3}{4}$ feet above the ileo-cæcal valve, and passes through the umbilicus. The duct normally undergoes obliteration about the end of the second month of fœtal existence. If it remains patent, it is known as Meckel's diverticulum. Only in rare cases does this remain open as far as the umbilicus. When it does so, a fistula is formed which discharges mucus, or even fæcal material. If fæces escape, the abdominal cavity must be opened, and the diverticulum excised. Sometimes a small section of the duct in the umbilical cord remains unobliterated; and when the stump of the cord separates, the mucous membrane of the vitelline duct grows, forming a tumour resembling a raspberry—an *enteroteratoma* or umbilical polypus. This should be treated by the cautery or by simple excision.

The Meckel's diverticulum may form a hollow tube of varying length which may be attached to the umbilicus by a fibrous band or may have no parietal attachment. It may become inflamed, may be the site of peptic ulcer in heterotopic gastric mucosa and a cause of melæna or it may cause strangulation or volvulus of the small intestine.

Describe Urachal Fistulæ and Urachal Cysts.

The urachus may remain patent throughout its whole length, and if there be any obstruction at the neck of the bladder or in the urethra, urine will escape at the umbilicus—a *urachal fistula*. If the umbilical extremity of the urachus closes normally, but the vesical extremity remains open (vesico-urachal sinus) any septic infection of the

bladder will spread into the urachus and cause an abscess. This abscess points at the umbilicus, and both pus and urine escape. Sometimes both the umbilical and vesical extremities of the urachus close, and the intervening portion becomes cystic—urachal cysts. In the majority of cases they are extra-peritoneal in position.

Such abnormal conditions of the urachus should be rectified by operation.

Classify Peritonitis.

| | | | | |
|---------------------|---|-----------|---|----------|
| Non-infective. | { | Diffuse | { | Acute. |
| Septic or infective | | | | Chronic. |
| | { | Localised | { | Acute. |
| | | | | Chronic. |

Mention the Chief Causes of Peritonitis.

(a) Intra-abdominal acute infections, *e.g.* appendicitis, diverticulitis, etc.

(b) Acute perforations of hollow viscera, *e.g.* duodenal ulcer.

(c) Septicaemia, *e.g.* pneumococcal.

(d) Vascular lesions of hollow viscera, *e.g.* volvulus, intussusception, strangulation.

(e) Mesenteric vascular lesions, *e.g.* embolism or thrombosis.

(f) Penetrating injuries and intraperitoneal ruptures of viscera.

(g) By ascending infection through the genital tract in the female.

(h) Aseptic peritonitis due to escape of urine in intra-peritoneal rupture of the bladder, blood bile or pancreatic juice. May become secondarily infected.

(i) Post-operative.

What are the Common Organisms ?

In peritonitis from a visceral lesion the organisms responsible are the normal inhabitants of the alimentary tract, *e.g.* bacillus coli, bacillus proteus and bacillus Welchii. Streptococcal infection is seen in puerperal infections; pneumococcal

and gonococcal infections and tuberculosis require separate discussion.

What are the Clinical Features of a Typical Case of Diffuse Peritonitis ?

(a) APPEARANCE OF PATIENT.—The face is pale, sunken, and anxious. In the later stages it becomes cyanosed.

(b) ATTITUDE OF PATIENT.—The patient lies in a supine position, with the knees drawn upwards.

(c) TEMPERATURE.—Frequently subnormal.

(d) PULSE.—Rapid and feeble—later becomes running in character.

(e) RESPIRATIONS.—Owing to the abdominal muscles being reflexly contracted (rigidity) the respirations are of the thoracic type.

(f) PAIN.—This is an early and prominent symptom. It is usually most acute in the region which is the seat of mischief. Pain is often absent towards the end.

(g) OTHER FEATURES.—Regurgitant vomiting ; no passage of flatus or fæces from bowels ; scanty urine, often containing albumin and indican. Subsequent distension of the abdomen with gas (meteorism) should be remembered.

Give the Treatment.

The treatment depends on the cause and on the general condition of the patient. The ideal treatment is laparotomy, removal or treatment of the cause, *e.g.* acute appendix or perforated ulcer, removal of gross contamination by suction or gentle swabbing and drainage particularly of any localised collection. The treatment of paralytic ileus is described elsewhere.

General measures and sulphanilamide therapy in appropriate infections are of value and the patient is nursed in Fowler's position.

Describe Localised Peritonitis.

This is the result of some intra-abdominal lesion which is not fulminating in character, *e.g.* appendicitis, or diverticulitis, in which there is time for the walling off of the lesion by the

omentum or adhesions. The onset is therefore that of the original disease and the signs of localised peritonitis, rigidity at first localised but gradually spreading, tenderness, and when an abscess forms the presence of a palpable swelling, are superimposed on those of the causal lesion. It is important that the diagnosis should be quickly established before spread to the general peritoneal cavity can occur.

What is the Treatment ?

The treatment is that of the causal lesion plus drainage, avoiding any soiling of the peritoneal cavity.

Describe Post-Operative Peritonitis.

Peritonitis, following operation, may result from (a) opening into an abscess without previously packing off the peritoneal cavity ; (b) contamination by gastric or intestinal material ; or (c) leaking of the sutures closing a viscus.

The usual signs of diffuse peritonitis are very feebly shown, or are even absent. An increasing rate of the pulse, the vomiting of fluid containing altered blood, and the rapid and progressive weakness of the patient suggests the diagnosis.

Describe Gonococcal Peritonitis.

This variety of peritonitis is practically confined to females, and follows gonorrhœal infection of the Fallopian tubes. In the very rare cases where the disease is found in males, infection arises from the vesiculæ seminales. Frequently only the peritoneum lining the pelvis is affected—pelvic peritonitis. Gonococci may be discovered in the vaginal or urethral discharge.

The patient complains of pain above the inguinal ligaments, there is nausea and fever. On abdominal examination tenderness is found in the hypogastrium, but there is as a rule no rigidity. There is tenderness per rectum or per vaginam and the diagnosis must be made from pelvic appendicitis.

Chronic infection causes adhesions in the pelvis with resulting dysmenorrhœa.

Treatment is non-operative if the diagnosis is certain, but if appendicitis cannot be excluded it is safer to operate. General measures and sulphanilamide or sulphapyridine therapy are of value.

Describe Pneumococcal Peritonitis.

The pneumococci reach the peritoneal cavity either by the blood stream during an acute pneumonia or along the genital passages in young girls. The disease is most common in, and is almost limited to, girls under twelve.

The clinical features are acute onset, child obviously ill and slightly cyanosed, pain and distension in the hypogastrium, diffuse tenderness, vaginal discharge, vomiting, and frequently diarrhoea. In the synpneumonic type the symptoms are superimposed on those of the pneumonia. Localised abscesses frequently develop.

The treatment depends on the diagnosis—if other acute abdominal lesions cannot be excluded then laparotomy is essential. Pneumococci in the vaginal discharge is presumptive evidence. Aspiration is probably justifiable to verify the diagnosis and blood culture is also of value. Treatment by sulphapyridine has greatly improved the results of treatment, but localised abscesses may still require drainage. The results of operation in the early stages are not encouraging.

Classify Tuberculous Peritonitis.

| | | | |
|------------|----------------------------|------------|------------|
| A. ACUTE | { (i) With fluid exudation | { Serous | { Diffuse |
| | | { Purulent | { Encysted |
| B. CHRONIC | { (ii) Dry | | |

Describe the Acute Form.

Acute tuberculous peritonitis is usually associated with acute miliary disease of the lungs. The constitutional symptoms and signs are those of general tuberculosis. The disease is frequently mistaken for one of the enteric group of fevers. It is practically always fatal.

Describe Chronic Serous Peritonitis.

When diffuse, this form is known as tuberculous ascites. It is commoner than the encysted variety. In addition to the ascites, enlarged mesenteric glands are found. They can be frequently palpated through the anterior abdominal wall. Distension of the abdomen, with dilatation of the superficial veins is a marked sign. The child is emaciated, and suffers from fever of a hectic type.

Treatment is by general measures and should be carried out in a sanatorium. There is no indication for surgery unless complications occur.

Describe Purulent Tuberculous Peritonitis.

The purulent form was formerly called "cold abscess of the belly." It is most commonly found in young females, secondary to salpingitis. The progress of the disease is more rapid than that of the serous variety, and the hectic fever more pronounced. The fluid in the peritoneal cavity looks like pea-soup. Laparotomy should be carried out as early as possible and the affected tube removed.

Describe Dry Tuberculous Peritonitis.

This variety results in the formation of adhesions, which cause the omentum and viscera to become matted together. Very little fluid is poured out, and therefore the abdomen is only slightly distended; on percussion, patches of dulness are found. These areas when palpated have a doughy feeling. The prognosis in dry tuberculous peritonitis is very grave, and surgical intervention is only called for in the presence of obstruction when the adhesions render operation a formidable procedure.

Describe Ascites.

Ascites is a collection of serous fluid in the peritoneal cavity. The main causes are: (a) hepatic cirrhosis, (b) tuberculous peritonitis, (c) malignant disease of the peritoneum, (d) cardiac disease, and (e) renal disease.

Give the Main Signs.

(a) A bulging in the flanks when the patient is in the supine position, and the front of the abdomen is flattened, but when well marked, the swelling is of a uniform globular outline.

(b) Dulness at the sides, as the fluid gravitates there; the centre is clear owing to the intestines being floated upwards. The upper limit is concave in the erect posture.

(c) The fluid is free, and any change of position alters the line of dullness, as the fluid gravitates to the lowest part.

(d) Swelling of the feet and ankles is an early symptom.

(e) The veins are very distended, and fill most quickly from below upwards, as the pressure of the free fluid obstructs the inferior vena cava.

(f) Fluctuation, or a fluctuation wave, is well marked.

A chronic fibrous thickening of the peritoneum usually follows ascites, leading to the formation of adhesions.

What is the Treatment?

Endeavour to remedy the cause of the condition. Tapping or *paracentesis* of the abdomen may be required. A Southey's tube is introduced between the umbilicus and the anterior superior iliac spine. Allow the fluid to drain away slowly. Some of the risks of the operation are—

(a) Syncope.

(b) Septic peritonitis.

(c) Hæmorrhage.

(d) Wound of the intestines.

In cirrhosis of the liver an attempt may be made to open up extra communications between the portal and systemic circulations by the Talma-Morison operation or by suture of the omentum to the parietes.

What are the Anatomical Points of Importance in the Localisation of Peritoneal Abscesses?

The greater sac of the peritoneum is divided into two compartments, the *supra-colic* and *infra-colic* by the omentum, transverse colon and transverse mesocolon. The

supra-colic compartment is bounded above by the diaphragm and contains the stomach, spleen, liver, gall bladder, and pancreas. The infra-colic compartment extends into the pelvis, contains the small bowel and is divided obliquely from above downwards and from left to right by the root of its mesentery.

The lesser sac or omental bursa lies behind the caudate lobe of the liver, the lesser omentum, the posterior surface of the stomach, and the second anterior layer of the great omentum, and communicates with the greater sac through the *epiploic foramen*, which opens into a pouch—the *right kidney pouch* or *Morison's pouch*, which is bounded above by the lower surface of the liver behind by the right kidney and below by the hepatic flexure. Infero-laterally this pouch is continuous with the *right paracolic gutter* which allows infection from the appendix to travel upwards or conversely leakage from a duodenal ulcer to track downwards and so into the pelvis. Morison's pouch becomes continuous above with the right posterior subphrenic space.

What is Subphrenic Abscess ?

As the name implies it is an abscess beneath the diaphragm. The space between the liver and the diaphragm is divided by the falciform, coronary and right and left triangular ligaments into four intra-peritoneal spaces, and the extra-peritoneal one known as the “bare area of the liver.” The right anterior and right posterior subphrenic spaces lie to the right of the falciform ligament and in front of and behind the right triangular ligament respectively. The *right anterior space* joins the supra-colic compartment below, but if infected is usually walled off at the lower margin of the liver by adhesions. This space is drained from the front.

The *right posterior subphrenic space* is continuous below with Morison's pouch and is usually infected from the appendix. It may be drained if it points below the last rib, and if not by the trans-pleural route.

The *left anterior subphrenic space* lies to the left of the falciform ligament and in front of the left triangular ligament and is continuous with the supra-colic compartment,

whereas the *left posterior subphrenic space* is actually the highest part of the lesser sac.

What are the causes of Subphrenic Abscess ?

This condition follows septic processes in the abdomen and is, as a rule, the result of neglected acute abdominal lesions, the spread of infection or faulty operative technique.

On the right side it follows :—

- (a) Perforated duodenal ulcer.
- (b) Appendicitis.
- (c) Empyema thoracis.
- (d) Suppurative lesions of right kidney.
- (e) Tropical abscess or infected hydatid of liver.
- (f) Suppurative cholangitis or cholecystitis.

On the left side it may arise from :—

- (a) Perforated gastric ulcer.
- (b) Suppuration of left kidney.
- (c) Empyema thoracis.
- (d) Abscess of the spleen.

What are the Clinical Features of a right-sided Abscess ?

In most cases the patient is seemingly making a fair recovery from the original lesion when, after an interval of some days, it becomes obvious that all is not well. The clinical features are :—

- (a) Toxæmia and swinging temperature.
- (b) Upper abdominal pain.
- (c) Increased pulse rate.
- (d) Increasing leucocytosis and sedimentation rate.
- (e) Gastro-intestinal derangement.
- (f) Profuse sweating.
- (g) Pain and tenderness over the lower costal margin.
- (h) An abdominal swelling (frequently).
- (i) A dome-shaped extension of the hepatic dullness.
- (j) On percussion, if gas is present in the abscess, and if there be no pleurisy, one can distinguish from above downwards, resonance of lung : tympanitic resonance of gas : dullness of pus and liver.

- (k) X-ray examination will reveal the raised diaphragm with either gas below it or a shadow continuous with that of the liver. The overlying lung may show consolidation.

Give the Clinical Features of a left-sided Abscess.

(a) Upward displacement of the diaphragm and the heart.

(b) On percussion from above downwards distinguish—resonance of lung; tympanitic resonance of gas; dullness of pus; resonance of stomach.

The remaining features are similar to those of an abscess on the right side.

What is the Treatment of Subphrenic Abscess?

The abscess must be evacuated whenever there are signs that the lung has been displaced upwards. The pus is usually reached by the transpleural route. Before commencing the operation, verify the diagnosis by an exploratory puncture, beginning at the tenth intercostal space.

HERNIA.

What is an External Hernia?

An external hernia may be defined as the protrusion of any of the contents of a cavity through an aperture in one of its walls. The aperture may be normally present, congenital, due to, e.g. the persistence of the processus vaginalis or acquired.

Give the Chief Varieties of External Hernia.

- (a) Inguinal.
- (b) Femoral.
- (c) Umbilical.
- (d) Ventral.
- (e) Lumbar.
- (f) Obturator.

What are the Various Parts of a Hernia ?

- A. SAC $\left\{ \begin{array}{l} \text{Upper end} = \text{Neck.} \\ \text{Lower end} = \text{Fundus.} \end{array} \right.$
 B. COVERINGS.
 C. CONTENTS.

The sac is formed from the parietal peritoneum, while the coverings consist of the remaining strata of the abdominal wall or thigh.

Mention the Contents of a Hernia.

- (a) Intestine (an *enterocele*).
 (b) Omentum (an *epiplocele*).
 (c) Bladder (a *cystocele*).
 (d) Meckel's diverticulum (a *Littre's hernia*).
 (e) Cæcum or pelvic colon (*sliding hernia*).
 (f) Testicle or ovary.

What is a Richter's Hernia ?

A Richter's hernia is an incomplete enterocele, *i.e.* only a portion of the circumference of the bowel is found in the sac.

What is the Etiology of Hernia ?

A hernia may be either congenital or acquired. The ventral, lumbar and obturator varieties are probably always acquired. Two factors are invariably present in the etiology of a hernia, namely, a loss of tone of the abdominal muscles and an increase in the intra-abdominal tension. There is still considerable controversy whether these two factors are sufficient and many believe that herniation without a pre-formed or potential sac is impossible. Constipation, phimosis, enlarged prostate, chronic bronchitis, and the lifting of heavy weights are common exciting causes of hernia.

Congenital hernia into a patent processus vaginalis and into the canal of Nuck and at the umbilicus are described below.

Hernia is more common in males.

What are the Signs and Symptoms of a Hernia ?

- (a) A swelling in the region of a hernial orifice.
- (b) On coughing a characteristic “ impulse ” is imparted to the swelling.
- (c) Vague colicky pains in the vicinity of the swelling.
- (d) In inguinal hernia some male subjects suffer from pain shooting along the spermatic cord towards the testis.

Give the Clinical Features of an Enterocoele.

- (a) A smooth elastic swelling, which is—
- (b) Resonant on percussion, and which has—
- (c) A gurgling sound during reduction.
- (d) The *first* portion of the bowel is *more difficult* to reduce than the *last* portion.

Give the Clinical Features of an Epiplocele.

- (a) An uneven doughy swelling, which is—
- (b) Dull on percussion ; there is an—
- (c) Absence of gurgling sound during reduction.
- (d) The *first* portion is *less difficult* to reduce than the *last* portion.

What are the Clinical Conditions of a Hernia ?

A hernia is either—

- (a) Reducible,
- (b) Irreducible,
- (c) Strangulated, or
- (d) Obstructed.

Mention the Chief Causes of Irreducibility.

- (a) The formation of adhesions between the sac and its contents.
- (b) Fatty accumulations in epiploceles.
- (c) A great increase in the bulk of the contents.

Describe Obstruction of a Hernia.

Obstruction or incarceration is brought about by the

impaction of faeces in an irreducible enterocoele. It usually occurs in connection with the umbilical herniæ of adults especially in middle-aged females.

There is colicky pain referred to the umbilicus and the hernia increases in size and becomes tender. The signs are those of chronic obstruction, but if left untreated acute obstruction and strangulation may supervene. In old and frail patients enemata may relieve the obstruction, but in otherwise healthy people operation is the best treatment.

What is meant by Strangulation of a Hernia ?

Strangulation occurs when there is any interference with the circulation through the portion of intestine or omentum in the sac. It also causes intestinal obstruction and is more common in small recent herniæ, than in large old standing cases.

What are its Pathological Features ?

The early changes result from venous obstruction of the strangulated bowel. The bowel becomes congested and a fluid transudate fills the sac. Owing to increasing pressure from the congestion of the bowel the arterial blood supply becomes cut off and gangrene of the bowel occurs. It is found first at the constriction grooves caused by the pressure of the constricting band (usually the neck of the sac) and on the apex of the strangulated loop. The bowel lumen is filled with blood-stained material. The bowel is swollen, hard, and deep claret in colour and the peritoneal coat loses its lustre. As in intestinal obstruction the bowel above is distended and that below the hernia is empty and firmly contracted.

As the viability of the bowel lessens organisms pass through its walls and infect the fluid in the sac.

What are the Clinical Features ?

Patient obviously ill, furred tongue, increased pulse rate. Dragging pain, nausea, vomiting and absolute constipation.

Pain and acute tenderness in the hernia, no impulse on coughing. Later, when gangrene of contents has occurred, there is relief of pain. Abdominal distension may be present. The vomiting at first consists of stomach contents, later it becomes bile-stained and eventually true faecal vomiting occurs.

What is the Treatment ?

There must be no delay as this is a grave emergency.

Operation must be carried out to divide the constricting ring and to deal, if necessary, with gangrenous bowel.

If the patient's condition permits the hernia is repaired.

Taxis is a dangerous method which is likely to do more harm than good and should not be employed.

The pre-operative measures are those of intestinal obstruction.

Sometimes when Taxis has been employed the symptoms persist; why ?

(a) Reductio en masse, *i.e.* the sac, with its contents still in a state of strangulation, has been pushed into the extra-peritoneal fat or between the fascia transversalis and the muscles.

(b) A strangulation may have existed within the sac, *e.g.* through a hole in the omentum.

(c) The bowel may be the site of a paralytic obstruction.

(d) The hernia may be reduced *en bissac*—*i.e.* where an intraparictal sac exists as a diverticulum from the ordinary sac and the hernia is displaced into it instead of complete reduction occurring.

(e) The gut may not have been viable or it may have given way during reduction.

(f) Obstruction may have been due to some other cause.

All these reasons serve to emphasise the dangers of taxis.

Name the Varieties of Inguinal Hernia.

(a) Oblique—lateral to the inferior epigastric artery.

- (b) Direct—or hernia through the *linea semi-lunaris*, *i.e.* medial to the inferior epigastric artery.

In addition an oblique hernia may be *congenital*, *funicular*, *infantile* or *encysted*.

Describe the Course of an Oblique Inguinal Hernia.

This form is called oblique or indirect from the direction it takes, passing through the oblique inguinal canal; it is sometimes called external because it lies to the outer side of the inferior epigastric artery. It follows exactly the same course as the testicle did, and receives the same coverings, *i.e.* it enters the canal at the abdominal inguinal ring and traverses its entire length. Should the sac end in the canal the hernia is called a *bubonocoele*, if it passes down to the scrotum through the superficial inguinal ring it is known as a *scrotal hernia*.

What are its Coverings?

- (a) Skin.
- (b) Superficial fascia.
- (c) External spermatic fascia.
- (d) Cremaster.
- (e) Internal spermatic fascia.
- (f) Extra-peritoneal fat.
- (g) The sac—not, properly speaking, a covering.

Describe the Descent of the Testis.

During the second month the developing testis is situated retroperitoneally below the kidney. Stretching upwards from the lower anterior abdominal wall is the *gubernaculum*, a musculo-fibrous structure which is said to guide the testis downwards during the third month to the region of the abdominal inguinal ring. The testis as it passes through the abdominal wall takes with it a process of peritoneum, the *processus vaginalis*, and the spermatic cord derives coverings from the various layers it traverses. The testis carries the processus vaginalis downwards into the scrotum. The processus remains patent and is connected with the peritoneal cavity until birth, when all but the lower part

should become obliterated. The lower part becomes the tunica vaginalis.

Describe the Varieties of Oblique Inguinal Hernia.

(a) CONGENITAL.—In this condition the processus vaginalis has remained patent throughout its whole length, and therefore the hernia descends into the scrotum and comes into contact with the testicle (Fig. 23). This variety is more common on the right than on the left side.

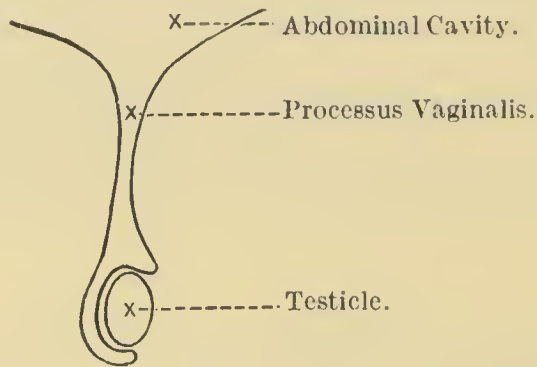


Fig. 23.—CONDITION OF THE PROCESSUS VAGINALIS IN CONGENITAL HERNIA.

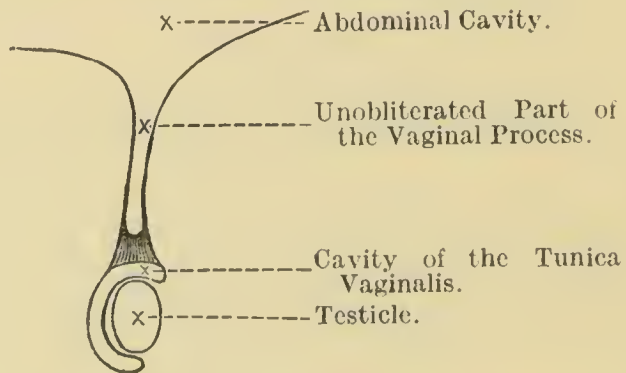


Fig. 24.—CONDITION OF THE PROCESSUS VAGINALIS IN FUNICULAR HERNIA.

(b) FUNICULAR HERNIA.—Here the processus vaginalis is only obliterated close to the testicle, leaving the whole of the upper part open (Fig. 24), and into this upper part the gut descends.

The hernia only extends to the *top* of the testicle, but does not envelop it ; it is always oblique and suddenly produced,

and is usually small. Remember that funicular hernia is the commonest form of inguinal hernia.

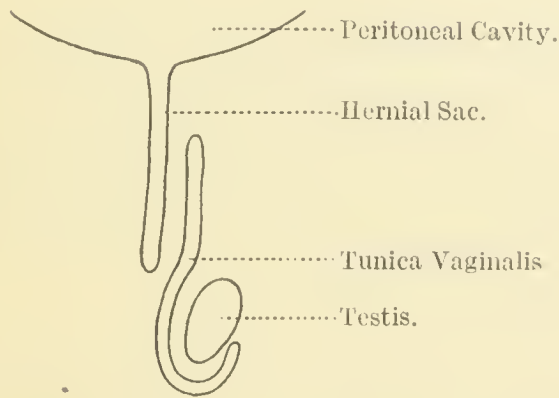


Fig. 25.—INFANTILE HERNIA.

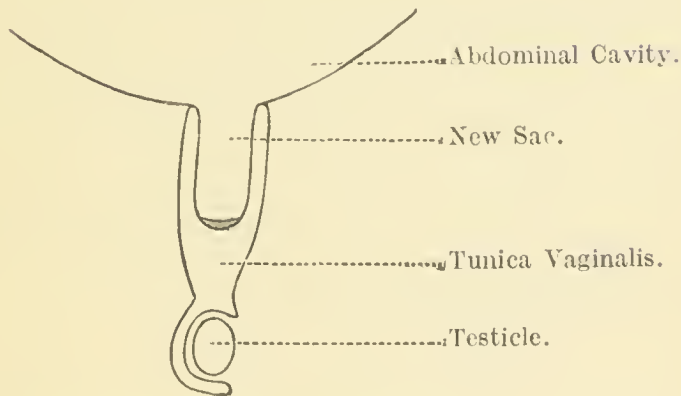


Fig. 26.—ENCYSTED HERNIA.

(c) INFANTILE HERNIA.—The processus vaginalis becomes obliterated above, but not below, thus resulting in a large tunica vaginalis, the diverticulum from which extends to the superficial inguinal ring and lies in front of the hernial sac—*infantile hernia*. Should the tunica vaginalis be of large size the hernial sac may become invaginated into it—an *encysted hernia*.

Is there a Processus Vaginalis in Females?

There is a corresponding process in relation to the round ligament; the unobliterated portion is termed the Canal of Nuck. Its presence may give rise to inguinal hernia

congenital or otherwise). The sac may contain an ovary or Fallopian tube.

What other Varieties of Oblique Hernia occur ?

In some cases, particularly in hernia associated with undescended testis, a diverticulum of the sac finds its way between the layers of muscles of the abdominal wall—*interstitial hernia*, or deep to them between the fascia transversalis and the peritoneum—*pro-peritoneal hernia*, or superficial—*pro-parietal hernia*.

What is the Course of a Direct Inguinal Hernia ?

This hernia is called direct or internal because it lies to the medial side of the inferior epigastric artery. It does not pass through the whole length of the inguinal canal (*i.e.* it does not enter the canal at the abdominal ring), but escapes from the abdomen through Hesselbach's triangle, enters the inguinal canal, pushing the falx inguinalis (conjoined tendon) before it, passes through the lower part of the canal and escapes by the superficial inguinal ring. At times it passes through the part of Hesselbach's triangle, which is not covered by the conjoined tendon.

What are its Coverings ?

In the usual form :—

- (a) Skin.
- (b) Superficial fascia.
- (c) External spermatic fascia.
- (d) Falx inguinalis (the conjoined tendon of the internal oblique and transversus muscles).
- (e) Fascia transversalis.
- (f) Extra-peritoneal fat.
- (g) The sac.

What is the Treatment of Inguinal Hernia ?

- (a) Operation.
- (b) Injection.
- (c) Wearing of a truss.

What are the Indications for each Method ?

OPERATION should be advised for all children and adults who are otherwise healthy. It is contra-indicated in the aged and where chronic bronchitis or other causes of strain are present. In infants who are healthy operation is a simple matter, but the baby must be making good progress before operation is contemplated.

The operations are described in *Operative Surgery*.

INJECTION THERAPY can only be carried out in cases of hernia which are reducible. The hernia is reduced and must be kept reduced throughout the period of treatment. Sclerosing fluid is injected round the neck of the sac twice weekly for four weeks or until satisfactory fibrosis is present.

TRUSS.—A truss may be advised in young infants, or in those who, for other reasons, are not fit for operation. A truss will not cure the hernia even in babies, and is merely a mechanical device to keep the hernia reduced. It is only of use in reducible herniæ and must never be advised in the herniæ of undescended testes.

How is an Inguinal Hernia Reduced ?

By *taxis* or manipulation. Place the patient supine with the shoulders and pelvis slightly raised and the lower limb flexed. The bladder should be empty. Steady the neck of the hernia with one hand, and make gentle pressure in the direction of the canal with the other.

How does a Truss Work ?

By maintaining sufficient pressure over the internal aperture and the walls of the canal to keep the hernia reduced. The pressure should be produced by a pad which matches the contour of the part and should be sufficient to prevent the hernia coming down during exercise or work.

How would you Measure for a Truss ?

Place the tape over the symphysis pubis, pass it upwards and laterally about two inches below the crest of the ilium, round the back, and similarly on the other side back to the

starting point. This measurement in inches, with the type of hernia, its size, whether the bones are flat or prominent, left, right or bilateral and whether recent or old standing, will tell the instrument maker all he requires to know.

Describe Sliding Hernia.

This type of inguinal hernia involves either the ascending or the descending colon. As these portions of the bowel are not completely covered by peritoneum, the sac is incomplete and it may be necessary to separate the viscus from the sac, repéritonise its posterior surface with the remains of the sac and then return it to the abdomen.

Very large herniæ may require a combined abdominal and inguinal operation.

FEMORAL HERNIA.

Describe the Anatomy of Femoral Hernia.

The hernia leaves the abdominal cavity at the femoral ring, and enters the femoral canal. It then passes through

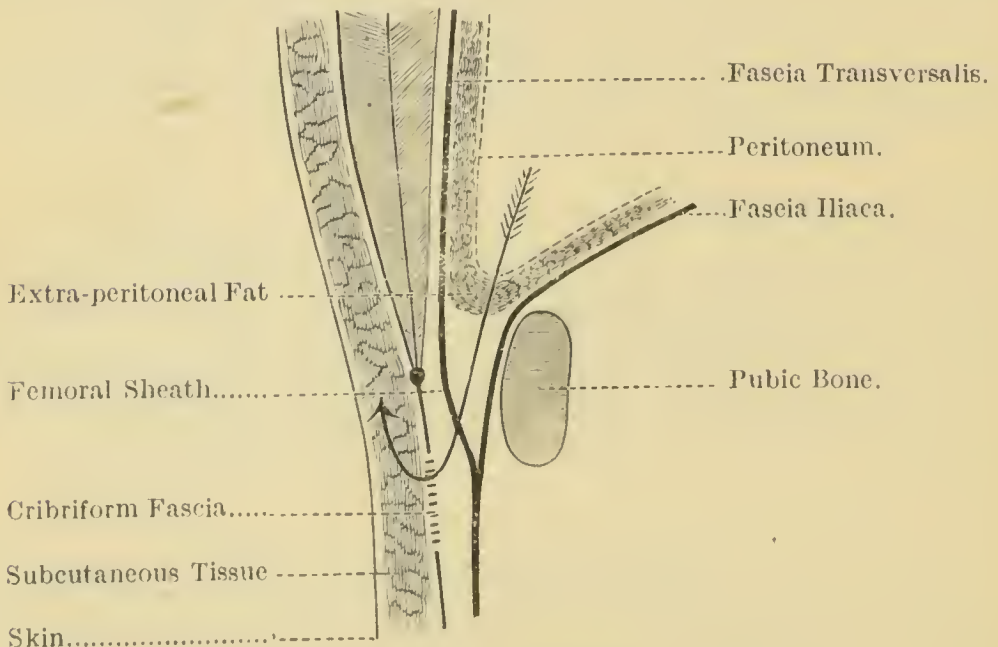


Fig. 27—COURSE OF A FEMORAL HERNIA.

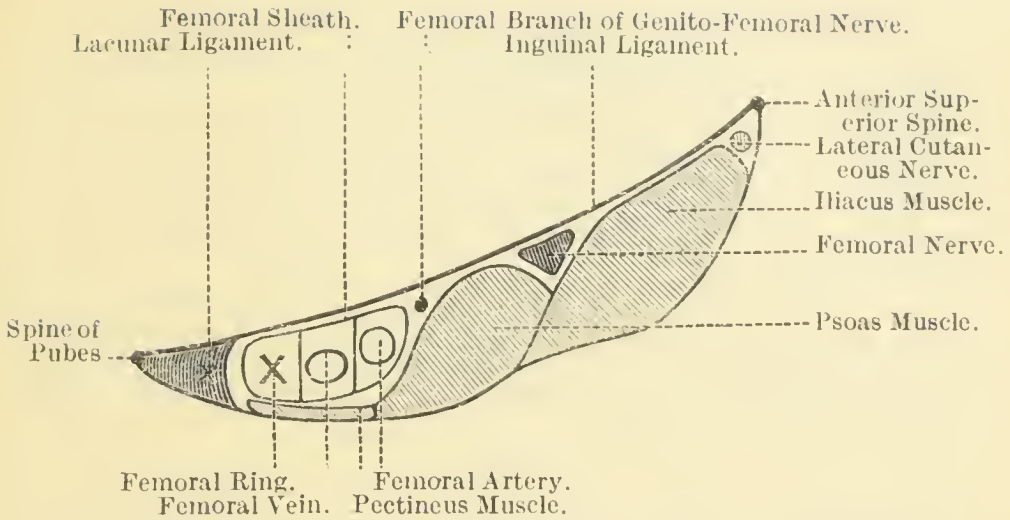


Fig. 28.—STRUCTURES BETWEEN THE INGUINAL LIGAMENT AND THE BONE.

the saphenous opening, and turns upwards towards the inguinal (Poupart's) ligament.

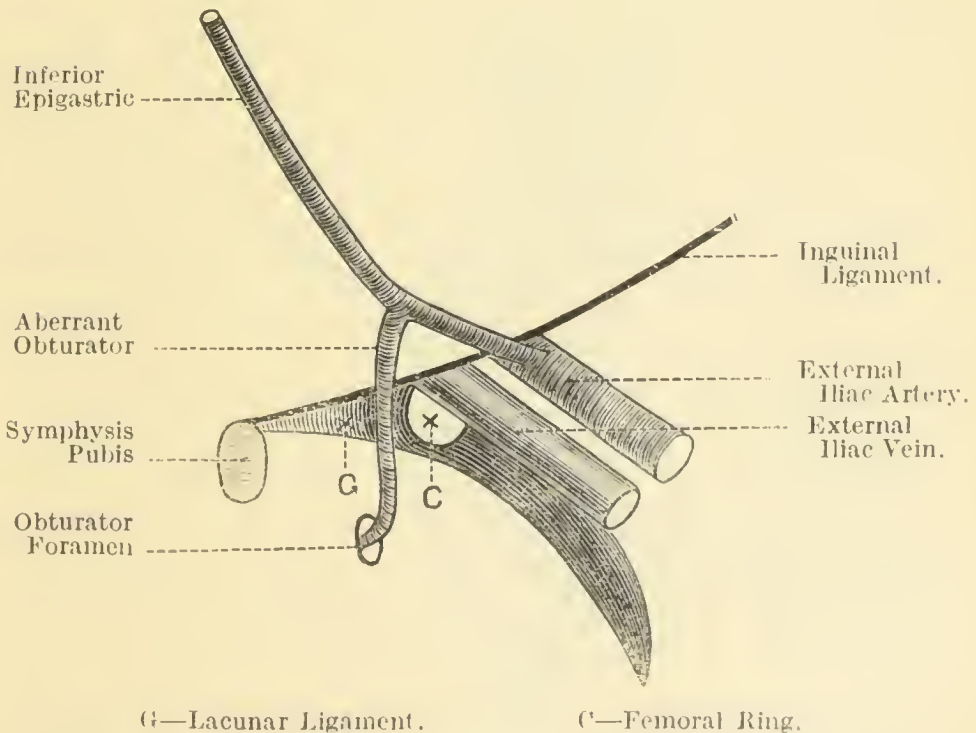


Fig. 29.—ABERRANT OBTURATOR—DANGEROUS FORM.

What are the Boundaries of the Femoral Ring ?

Anterior = The inguinal ligament.

Posterior = Fascia of pectineus, pectineus muscle, and os pubes.

External = Femoral vein.

Internal = Sharp free edge of lacunar ligament.

The “dangerous” variety of the aberrant obturator when present forms an internal relation (Fig. 29); the “non-dangerous” variety an additional external relation.

What are the Coverings and Contents of a Femoral Hernia ?

COVERINGS—

(a) Skin.

(b) Superficial fascia.

(c) Cribriform fascia.

(d) Anterior layer of femoral sheath=fascia transversalis.

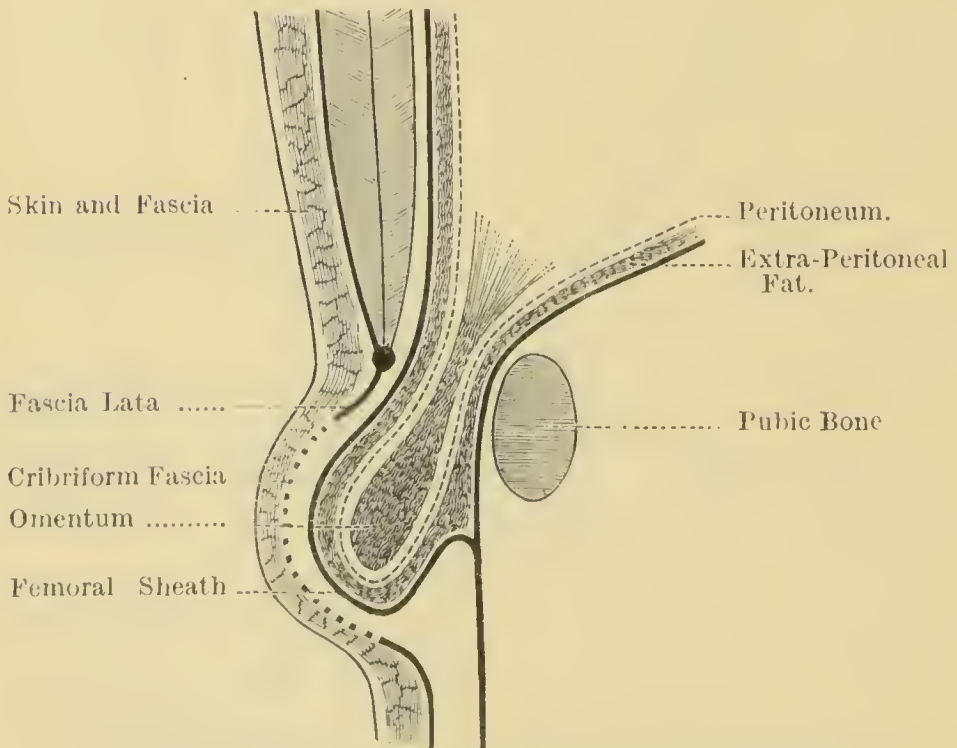


Fig. 30.—FEMORAL EPIPOCELE AND ITS COVERINGS.

(e) Septum crurale=sub-peritoneal fat.

(f) Peritoneum forming the sac.

CONTENTS—

The contents usually consist of ileum or omentum.

Richter's hernia is commonly found here.

From what has Femoral Hernia to be diagnosed ?

(a) ENLARGED GLANDS—There is no impulse on coughing ; they can be raised from the deep structures ; some obvious cause for the enlargement is present.

(b) INGUINAL HERNIA—Here the neck of the sac lies above the inguinal ligament and internal to the pubic tubercle ; in femoral hernia the neck of the sac is below the inguinal ligament and external to the pubic tubercle. Lastly, in femoral hernia the inguinal canal can be felt to be empty.

(c) VARIX OF THE GREAT

SAPHENOUS VEIN—The remaining portion of the vein may be found varicose. The varix disappears when the patient lies down, but if the finger be placed over the femoral ring, the swelling may reappear on the patient standing up—a femoral hernia would not.

(d) PSOAS ABSCESS—Examine the vertebral column for signs of Pott's disease. Swelling in the iliac fossa is generally present.

The radical operation for femoral hernia is described in *Operative Surgery* (Part III).

UMBILICAL HERNIA.

Give the Varieties of Umbilical Hernia.

- (a) Congenital.
- (b) Infantile.
- (c) Adult.

Describe the Congenital Variety.

As its name implies this hernia is present at birth and varies from the projection of a portion of intestine into the umbilical cord where it may be ligated or divided to the condition known as *exomphalos*, where there is a failure of development of the anterior abdominal wall. In *exomphalos* the gap in the abdominal wall is covered by transparent membrane continuous with the cord and through the gap almost any viscus may project. Operation is the only possible treatment.

Describe the Infantile Type.

As its name implies this hernia is seen in babies and young children. A true congenital sac, often with a wide neck, is present and the protrusion occurs at the umbilicus. The hernia is easily reduced and appears on crying or straining.

Spontaneous cure is likely and the hernia should be reduced and reduction maintained by the application of a metal disc enclosed in lint and kept firmly in place by sticking-plaster.

If this fails small herniæ may be reduced and a ligature applied subcutaneously or an operative repair retaining the umbilical scar may be carried out.

Describe the Adult Type.

This hernia is really para-umbilical and it passes through the abdominal wall just above the umbilicus. It is mainly found in stout multipara with flabby abdominal walls. The hernia rapidly becomes of large size and the sac tends to become loculated. In addition to omentum the transverse colon is commonly present and herniæ of more than

small size are usually irreducible and frequently incarceration occurs.

Treatment is by operation and the technique usually employed is Mayo's operation. (See *Operative Surgery*.)

Describe Epigastric Hernia.

This hernia occurs through the linea alba above the umbilicus. There is a protrusion of extra-peritoneal fat which may, in the course of time, lead to the formation of a small hernial sac. Even small herniæ may be the cause of symptoms and the treatment is by operation.

Describe Ventral (Incisional) Hernia.

This hernia occurs through the site of a previous operation scar. It may result from hematoma, sepsis, delayed healing in debilitated subjects, or from the use of drainage tubes. The hernia may be loculated and there are frequently numerous adhesions between the wall of the sac and its contents. Incarceration is liable to occur and the hernia should be repaired by operation (a) by reconstituting the previous layers of the wound, (b) by fascial graft (Gallie), or (c) by cutis vera graft. Burst abdomen or disruption of the wound before healing has taken place should not be confused with incisional hernia.

OBTURATOR HERNIA.

Describe Obturator Hernia.

The lower portion of the ilcum escapes through the obturator foramen, above the pelvic fascia, displacing the normal structures traversing this orifice. The obturator nerve is generally pushed to the outer side, and the displaced vessels postero-externally. Surrounding the neck of the sac is the ascending ramus of the pubes, and the prominent margin of the obturator membrane. Because of this, strangulation is very apt to occur.

After passing through the foramen, the hernia either insinuates itself between the membrane and the obturator externus, or passes above the muscle to lie beneath the

pectineus, occupying a position to the inner side of the femoral vessels.

Give the Coverings.

- (a) Skin and superficial fascia.
- (b) Fascia lata.
- (c) Pectineus.
- (d) Fascia over the obturator externus.
- (e) Obturator externus (sometimes).
- (f) Subperitoneal fat.
- (g) Peritoneum (sac).

How is it Diagnosed ?

This hernia is very rare and is frequently only diagnosed by laparotomy for intestinal obstruction. Pain referred along the obturator nerve to the knee is sometimes present and this, with the signs of obstruction, is very suggestive of obturator hernia.

The treatment is by operation.

DIAPHRAGMATIC HERNIA.

Describe Diaphragmatic Hernia.

Hernia, through the diaphragm, may occur at one of the normal apertures, *e.g.* the œsophageal opening or through an aperture remaining following a failure of development, *e.g.* of the left crus—a costo-vertebral hernia, or may be the result of trauma, the usual site being the left dome. At this site neither the congenital nor the acquired hernia has a sac.

The important distinction between the types of congenital hernia is not the site, but whether the œsophagus is of normal length or congenitally shortened. A short œsophagus makes operation impossible. The stomach, spleen, splenic flexure and small intestine may form the contents of the hernia.

Give the Clinical Features and Treatment.

The hernia may cause no symptoms or may be the cause

of vague symptoms, and be found accidentally on barium meal examination.

There may be pain or a sense of fullness on eating, paroxysms of coughing, or shortness of breath. The heart is displaced to the right and the normal area of cardiac dullness is resonant. Vomiting without warning is sometimes found.

Treatment.—In cases where the symptoms are mild and in cases with a short œsophagus, no treatment is advisable. In other cases with severe symptoms the hernia is repaired by a combined abdominal and trans-pleural operation.

STOMACH AND DUODENUM.

Describe the methods employed in the Investigation of a Case Complaining of Gastric Symptoms.

(a) *Careful History*, noting habits of eating, smoking and drinking, duration and frequency of attacks. Note of pain, vomiting, loss of weight, jaundice, state of bowels, hæmatemesis and melæna.

(b) *Physical Examination* by inspection, palpation, auscultation and auscultatory percussion; not of much value unless shows loss of weight, tenderness, rigidity, dilatation or tumour.

(c) *Test Meal.*—(i) Ewald's method.

(ii) Fractional test meal.

(iii) Use of histamine.

(d) *X-ray Examination* after the giving of opaque meal is of great value. Screen examination reveals size, shape, mobility, peristalsis, and persistent deformity of stomach and duodenum, while films are of little value except as a permanent record of an ulcer niche, a filling defect, or as a series of persistent deformity of the duodenal cap.

(e) *Gastroscopy* renders inspection of the mucosa possible and is an additional method of diagnostic importance.

Describe the Fractional Test Meal.

On the previous evening only a light supper with two charcoal biscuits. Next morning fasting juice withdrawn by Ryall's tube and 1 pint of thin gruel taken.

Specimens taken at $\frac{1}{4}$ – $\frac{1}{2}$ hour intervals.

Particles of charcoal suggest delay in emptying.

Each specimen is examined and free and total acidity is estimated.

Free acid is absent as a rule in gastric carcinoma and in some forms of anæmia.

The method, if considered along with the clinical and radiological findings, is of definite diagnostic value and may decide the treatment to be adopted.

It is now more common to employ the histamine method. The fasting juice is collected as above and another specimen taken after histamine.

Describe the Injuries to which the Stomach is Liable.

The stomach may be ruptured by violence through the abdominal wall or by increased pressure within, *e.g.* endotracheal tube in œsophagus by mistake, or punctured in stab or gun-shot wounds.

The wound may involve the mucous coat, causing hæmatemesis, or the serous coat with the development of a perigastric abscess or all the coats may be ruptured, causing pain, collapse, rigidity. The diagnosis from contusion of the abdominal wall or a wound of the abdominal wall without a visceral complication is often difficult and early operation so essential that operation is advisable in doubtful cases.

Treatment is early operation, closure of perforation, and drainage if necessary.

What is the Treatment of Foreign Bodies in the Stomach?

Foreign bodies are swallowed by young children, by lunatics and sometimes accidentally by normal adults. In most cases, if the foreign body passes the cricoid cartilage, it will be passed successfully. Kirby grips in young children are dangerous, as they tend to be held up in the duodenum. If X-ray shows that the foreign body has been held up for some days, in the case of multiple foreign bodies or hair-balls, or if complications arise, the operation of gastrotomy should be performed.

Describe Congenital Hypertrophic Pyloric Stenosis.

The cause of the condition is not known, but it occurs mostly in male infants and usually begins during the first weeks of life. The pyloric musculature becomes greatly hypertrophied and the pyloric canal becomes contracted and obstructed by the redundant mucosa. The stomach becomes hypertrophied and later dilated, but the duodenum is normal.

The symptoms and signs are :—

- (a) Baby normal initially.
- (b) Vomiting—becoming persistent and projectile without bile.
- (c) Absolute constipation.
- (d) Loss of weight—wasting.
- (e) Large stomach, visible peristalsis from left to right, palpable pylorus.
- (f) Barium X-ray not usually necessary. Shows enlarged stomach with great delay in emptying.

What is the Treatment ?

Some cases, due to spasm only, will respond to gastric lavage, yumidren, and regulation of feeding.

Early Rammstedt operation before emaciation is the best treatment.

Describe Acute Dilatation of the Stomach.

Acute dilatation of the stomach, or gastro-mesenteric ileus, most frequently arises as a sequel to abdominal operations, especially those on the gall-bladder and bile ducts. A certain number follow severe injuries, and rarely, dietetic excesses. In the majority of cases dilatation of the duodenum as far as the point where it is crossed by the superior mesenteric vessels occurs. The condition is due to gastric atony. The leading theories to explain the condition are that it is brought on by—(a) dragging upon the mesentery and superior mesenteric vessels by the post-operative displacement of the small bowel into the pelvis, with constriction of the duodenum ; (b) disturbance of the autonomic nervous mechanism at the time of operation.

The clinical features are *vomiting*, coming on after post-anæsthetic sickness has subsided, usually about twenty-four hours after an operation, and *abdominal distension*. Copious amounts of fluid are vomited without force and the patient's condition deteriorates rapidly, so that thirst and collapse are the later features.

Treatment is immediate gastric lavage or indwelling tube and the prone position, with the foot of the bed raised.

PEPTIC ULCERATION.

Give the Etiology of Gastric Ulcer.

Ulceration of the stomach wall may result from several causes :—

- (a) Oral sepsis.
- (b) Embolism of the gastric vessels ; the devitalised area subsequently undergoes ante-mortem digestion.
- (c) Trauma and especially corrosive poisons.
- (d) Anæmia, dietetic indiscretions, and alcoholic over-indulgence have also been severally blamed.

Describe Acute Ulcers.

Acute ulcers are most commonly found in young females under the age of thirty. These ulcers are often multiple. They usually occur in the pyloric region near the lesser curvature. Superficial ulcerations are termed erosions. An acute ulcer has a punched-out appearance, the edges being clean cut. Owing to the gastric mucous membrane suffering more damage than the remaining coats, the ulcer is described as being like a telescope. The edges are often œdematous but show no signs of induration. Accordingly the ulcer heals without much scarring.

In some cases healing does not occur and chronic ulceration supervenes. The factors which delay healing are not fully known, but hyperchlorhydria, the misuse of tobacco and alcohol, and hypertonicity of the stomach, are of some importance. The bulk of peptic ulcers occur in the first part of the duodenum and along the *magenstrasse*, *i.e.* the

specialised area of the lesser curvature which transmits fluid direct from cardia to duodenum. Peptic ulceration may occur at the stoma of a gastro-jejunostomy when it is referred to as a stomal or jejunal ulcer.

Describe Chronic Ulcers.

A chronic ulcer is irregular in outline with a hard greyish-white base, and has indurated edges, hence it is said to be "terraced." Its base is often adherent to surrounding viscera. A chronic ulcer is most commonly found in the pyloric segment and on the posterior wall. When it crosses the lesser curvature, a "saddle-shaped" ulcer results. A small superficial ulcer—a "contact" ulcer (Mayo)—often appears on the opposite wall to the main ulcer. Multiple chronic ulcers are rare.

The ulcer tends to heal by fibrosis, but is also liable to break down again. Repeated fibrosis and its consequent contraction leads to deformity of the stomach, *e.g.* pyloric stenosis in duodenal ulcer and hour-glass stomach in gastric ulcer.

Give the Signs and Symptoms of Gastric Ulcer.

Three cardinal symptoms are present—(a) pain, (b) vomiting, and (c) hæmorrhage.

The pain has the following characteristics—

- (a) It comes on between half an hour to two hours after food, the latter time applying to an ulcer situated near the pylorus.
- (b) It varies from a slight discomfort to excruciating agony, but is usually relieved by the taking of alkalis.
- (c) It is referred to the epigastrium; if the ulcer is near the cardiac end of the stomach, the most severe pain is a little to the left of the middle line; if in the vicinity of the pylorus, the pain is felt a little to the right of the middle line.
- (d) The pain often becomes worse as digestion progresses, and is accompanied by flatulence and water-brash.

What is the Vomiting of Gastric Ulcer due to ?

Vomiting is usually associated with the later and not the early stages of gastric ulcer. It frequently relieves the pain, and may be due to one of three causes :—

- “(a) In the early stages, vomiting of partially digested food, without much mucus, is reflex—Nature’s effort to get rid of the irritating food.
- “(b) In the later stages vomiting of small quantities of ill-digested food, with much mucus, is the result of chronic gastritis.
- “(c) Vomiting of large quantities of sour fluid with partially digested food is an indication of pyloric stenosis, or hour-glass stomach.”
(Paterson.)

When hæmorrhage occurs in gastric ulcer the blood may be either vomited or passed in the stools. When vomited immediately it is bright red in colour ; if retained in the stomach for some time it will have a “coffee-ground” appearance. In those cases in which blood passes into the intestinal canal, melæna results.

Other features of gastric ulcer are—(a) often tenderness over the epigastrium ; (b) signs of anæmia ; and (c) hyperchlorhydria in some cases, but the development of gastritis makes the acidity an unreliable sign ; (d) X-ray examination may give definite evidence *i.e.* an ulcer crater may be seen, or presumptive evidence, such as persistent localised spasm or alteration of the mucosal pattern.

Describe Duodenal Ulcers.

Duodenal ulcers may result from :—

- (a) Burns.
- (b) Uræmia.
- (c) Septicæmia.

The great majority, however, are chronic in nature and most probably toxic in origin. A chronic duodenal ulcer is usually found in the first part of the duodenum, usually within one and a quarter inches of the pylorus. A small superficial ulcer is often present on the opposite wall, “the kissing ulcer.” The main ulcer has a central depression

with indurated margins. Unlike gastric ulcer it rarely becomes malignant. It is more common in males than in females, and mainly occurs between the ages of twenty-five and forty.

Give the Clinical Features.

The clinical features of a chronic duodenal ulcer are :—

- (a) A feeling of discomfort and bulging in the epigastrium about two hours after meals.
- (b) Heartburn and eructation of gas.
- (c) Attacks of pain—"hunger pain"—relieved on eating food or by taking an alkaline mixture. The pain is most acute about 12 a.m. and 2 a.m. Frequently the pain is relieved by pressure.
- (d) Complete remission of the symptoms for weeks at a time.
- (e) The attacks are commoner in winter than in summer, and are very apt to come on from overwork or worry.
- (f) Occult blood in the stools ; sometimes melæna.
- (g) Slight rigidity of the upper part of the right rectus muscle during an attack and tenderness in the middle line, and slightly to the right above the umbilicus.
- (h) Vomiting is rare ; it usually indicates either hæmorrhage into the stomach, or a commencing pyloric stenosis.
- (i) The test meal shows hyperchlorhydria.

X-ray examination shows either a definite and constant deformity in the first part of the duodenum, or else when pyloric obstruction exists, gastric hyperperistalsis with a six-hour retention of food.

What is the Treatment of Peptic Ulcer ?

All gastric and duodenal ulcers should be treated by medical measures unless—(a) there are complications such as pyloric stenosis or erosion of the pancreas ; (b) medical measures have been given a fair trial and failed ; (c) in long standing gastric ulcers where there is a possibility of malignant change.

If surgery is required partial gastrectomy is the operation of choice in both cases.

What are the Complications of Peptic Ulcers ?

- (a) Hæmorrhage.
- (b) Perforation $\left\{ \begin{array}{l} \text{Acute.} \\ \text{Chronic.} \end{array} \right.$
- (c) Hour-glass stomach.
- (d) Pyloric stenosis.
- (e) Carcinomatous change.

What is the Treatment of Hæmatemesis ?

The vomiting of a large amount of blood gives the typical picture of severe hæmorrhage and the treatment usually advised is continuous blood transfusion and a full medical régime. In some cases, in spite of this, the hæmorrhage does not stop and some surgeons, notably in Russia, advise partial gastrectomy for cases known to be due to ulcer.

Describe Perforation of a Gastric Ulcer.

Perforation may be either acute, sub-acute, or chronic. In the first variety, the gastric contents usually escape freely into the peritoneal cavity leading to peritonitis. Chronic perforation occurs into a mass of previously formed adhesions, and results in a perigastric abscess. Perforation is more common in ulcers situated on the anterior wall of the stomach, and specially in those near the pylorus, and in the region of the lesser curvature.

Give the Clinical Features of Acute Perforation.

- (a) A sudden intense pain in the epigastrium, which is later diffused over the abdominal wall.
- (b) Signs of collapse, with cold extremities.
- (c) Rapid but shallow respiration, gradually becoming thoracic in character.
- (d) Subnormal temperature.
- (e) Quick feeble pulse.
- (f) Retracted abdomen.
- (g) Rigidity of upper part of recti muscles.

- (h) Tenderness over epigastrium and left hypochondrium.
- (i) Often vomiting.
- (j) Frequently a diminution of the liver dullness.

After lasting for two to five hours, in the majority of cases, a temporary improvement sets in ; it is quickly followed, however, by the signs of septic peritonitis, *i.e.*—(a) small running pulse ; (b) raised temperature ; (c) distension of abdomen ; (d) tympanitic abdomen ; (e) pinched features ; (f) feeble thoracic respiration.

Describe Perforation of a Duodenal Ulcer.

Duodenal perforation is more frequent than gastric perforation. The escaping fluid usually collects in the right renal pouch, then passes down the outer border of the ascending colon, and finally gravitates into the pouch of Douglas.

There may be no history of previous dyspepsia and the perforation is usually on the anterior wall of the first part of the duodenum. There may be diminution of liver dullness and pain in the shoulder from irritation of the diaphragm. The other signs are similar to those of perforated gastric ulcer. In difficult cases a straight X-ray may show gas under the diaphragm.

What has the Acute Perforation to be Diagnosed from ?

Acute perforation must be diagnosed from :—

- (a) Lobar pneumonia.
- (b) Diaphragmatic pleurisy.
- (c) Acute food poisoning.
- (d) Acute appendicitis.
- (e) Acute pancreatitis.
- (f) Ruptured ectopic gestation.
- (g) Biliary colic.

What is the Treatment ?

Laparotomy as soon as possible. The perforation is found and closed if possible by suture, if not by omental graft. If there is considerable soiling of the peritoneal cavity or if the perforation occurred over eight hours

before operation drainage is necessary. Gastro-enterostomy is only indicated should there be marked pyloric stenosis.

Describe Chronic Perforation.

Chronic perforation usually occurs from an ulcer situated upon the posterior wall of the stomach, and, as previously mentioned, generally forms a perigastric abscess. The latter frequently passes upwards into a fossa bounded by the diaphragm, the left lobe of the liver and the spleen (*see* subphrenic abscess).

Describe Jejunal Ulcer.

This condition follows gastro-jejunostomy in unsuitable cases, usually those with excessive gastric motility and hyperchlorhydria. The symptoms are pain in the umbilical region two to three hours after food, and the other signs are those of ulceration elsewhere. The ulcer may perforate or may penetrate into the transverse colon causing a gastro-jejuno-colic fistula.

If medical measures fail operation is indicated to undo the anastomosis, and in the case of colic fistula, it may be necessary to isolate and close the affected segment of colon and perform the operation on the anastomosis at a later date.

Describe Hour-glass Stomach.

An hour-glass stomach is generally secondary to a healed ulcer which has involved the lesser curvature. The cardiac segment of the stomach becomes ballooned, and if any pyloric stenosis be present, the pyloric segment of the stomach also dilates. The upper dilatation is the bigger of the two, and is hidden beneath the costal margin.

Give the Clinical Features.

The signs and symptoms of hour-glass stomach closely resemble those of dilatation of the stomach, *i.e.* vomiting, pain, and offensive eructations.

The diagnosis is established by barium meal examination.

The treatment is surgical and may be partial gastrectomy,

gastro-enterostomy to the upper or both pouches, or gastro-gastrostomy.

Describe Pyloric Stenosis.

At first the stomach hypertrophies, but later it becomes greatly dilated. The characteristic sign is the vomiting of large amounts of foul partly-digested food, and it may be possible to recognise food taken some time before. There is marked loss of weight and constipation. The diagnosis is confirmed by barium meal which shows a dilated stomach with marked retention.

Owing to the absence of hyperchlorhydria gastro-jejunostomy is the ideal treatment.

Describe Carcinoma of the Stomach.

Carcinoma of the stomach may give rise to a large fungating tumour or to an ulcer which may or may not have had its origin in a chronic ulcer. In other cases the tumour is of the scirrhous type and it spreads in the submucosa, producing the small thick "leather-bottle" stomach.

The carcinoma rarely involves the duodenum, but in the region of the pylorus it may cause obstruction. It spreads locally and may reach the peritoneal coat and so involve the peritoneal cavity and by this transcoelomic spread give rise to the Krukenberg tumour of the ovary. Spread by lymphatics depends on the site of the tumour and is to the glands in the lesser omentum along the lesser curvature, to those along the greater curvature or to the splenic glands. In some cases spread to the left supraclavicular glands occurs apparently by the thoracic duct.

The disease is most common in males between the years of forty and sixty.

What are the Clinical Features?

A cancer situated in the region of either the pyloric or cardiac orifices will give rise to more definite signs and symptoms than one growing in the body of the stomach. Very frequently the features resemble those of a gastric ulcer. In a typical case, however, the following will be noticed :—

(a) The pain is more diffuse, more constant, and less acute than in ulcer. *The pain is not relieved when the stomach is empty.*

(b) Vomiting is mainly present when the growth is in the pyloric area. The vomitu has an offensive odour, often contains sarcinae, usually the Oppler-Boas bacillus, and practically always blood. The hæmorrhage may either be "occult," or cause the "coffee grounds" appearance.

(c) On abdominal palpation a tumour can frequently be recognised in the advanced stages of the disease. The tumour moves with respiration, can be moved laterally, and often has a transmitted pulsation from the aorta.

(d) Anæmia and loss of weight.

(e) A slight leucocytosis.

(f) Diminution or absence of free hydrochloric acid.

(g) Sometimes ascites.

(h) Barium meal examination may reveal the positive evidence of a filling defect or the presumptive evidence of the persistent holding up of the peristaltic wave at one point. Pyloric stenosis may also be proved.

(i) The gastroscope may be employed.

What is the Treatment ?

In operable pyloric tumours partial gastrectomy, if inoperable a gastro-enterostomy.

In tumours at a higher level total gastrectomy may be indicated, and if they are inoperable and obstruct the cardia gastrostomy or jejunostomy may be required.

INTESTINAL OBSTRUCTION.

Differentiate between Obstruction and Strangulation.

Intestinal obstruction is the name given to interference with the onward passage of the intestinal contents. It may be acute, *i.e.* sudden in onset or chronic and progressive, and may arise from a variety of causes.

Strangulation is a much more serious condition and is the name given when the blood supply of the affected intestine is cut off. Strangulation of an external hernia is described in the section on hernia, but internal strangulation also occurs.

What are the Causes of Intestinal Obstruction ?

CONGENITAL, *e.g.* imperforate anus, atresia of intestine.

| | | |
|------------|---|---|
| MECHANICAL | { | <i>Extramural</i> , <i>e.g.</i> external or internal hernia, adhesions, bands, <i>e.g.</i> Meckel's diverticulum, volvulus. |
| | | <i>Mural</i> , <i>e.g.</i> tumours, fibrous strictures. Intussusception might be considered in this group. |
| | | <i>Intramural</i> , <i>e.g.</i> impacted gall-stone or foreign body. |

PARALYTIC, *e.g.* the ileus of peritonitis.

INTERFERENCE WITH BLOOD SUPPLY, *e.g.* embolism or thrombosis of the mesenteric blood-vessels.

What are the Clinical Features of Acute Intestinal Obstruction ?

Previous to the acute obstruction the patient is usually in good health. The condition comes on suddenly. The main symptoms and signs are :—

- (a) Acute abdominal pain with attacks of violent colic.
In small bowel lesions pain is umbilical and in large bowel hypogastric in position.
- (b) Vomiting : first the contents of the stomach, then bile-stained fluid, and lastly vomit with a faecal odour. The higher the lesion the sooner and more marked the vomiting.
- (c) Absolute constipation, both of faeces and flatus.
- (d) More or less tympanitic distension of the abdomen.
- (e) The abdominal wall is not rigid and not tender.
- (f) The patient is conscious and may not appear to be very ill.

In the presence of a strangulation or vascular lesion the following symptoms and signs will be present in addition to the above and may quite overshadow them :—

- (a) Subnormal temperature.
- (b) Cold clammy skin. Lowered blood pressure, *i.e.* shock.
- (c) Marked thirst.

It is only in the late stages that the signs of peritonitis ensue.

What is the Morbid Anatomy of Obstruction ?

At the time of operation it will be noted that the segment of bowel above the lesion is :—distended with gas and intestinal contents ; its walls are œdematous, congested, hæmorrhagic, and show patches of erosion of the mucosa. The segment below the lesion is contracted, empty and hard to the touch and pale in colour.

If strangulation be present the changes in the bowel above and below it will be as above, but the affected area shows the following changes. When the condition is that of closed loop obstruction and strangulation, the pressure will firstly affect the veins, the loop becomes congested and there is hæmorrhage into its lumen with great distension. There is a blood-stained exudation of plasma into the hernial sac or peritoneal cavity from its outer surface. As the tension increases so does the constriction and the arterial blood supply is cut off, the points of maximum intensity being at the constriction ring and the mid point of the loop. The bowel wall loses its gloss and it becomes permeable and allows further leakage and the passage of organisms. Finally the loop becomes black and gangrenous. The sudden release of tension may allow the absorption of the toxic contents. The cause of the shock in large loops is almost certainly the loss of blood into the lumen.

In all obstructions the persistent vomiting leads to a loss of chloride and alkalosis. The loss of chlorides may be shown by their diminution or absence in the urine.

The lethal nature of strangulation is due to (a) local factors, *e.g.* gangrene of the bowel, perforation, peritonitis, (b) general or systemic factors, *e.g.* the blood and plasma loss and the changes in the blood chemistry. In all cases of obstruction the higher the lesion the more severe the chemical changes are.

How would you Diagnose between Small and Large Bowel Obstruction ?

In large bowel obstruction distension is more marked, the onset is less acute, the general symptoms and signs are less marked, the vomiting is later and less copious, the pain is less and is in the hypogastrium. In small intestine ob-

struction, if there is doubt or difficulty, a straight X-ray may reveal distended loops of bowel and fluid levels.

How would you Examine a Suspected Case of Intestinal Obstruction ?

Take a careful history. Notice distension, generalised and central in small intestine distension, and peripheral in large intestine. Localised distension, peristalsis and tenderness are all noted. Examine the hernial orifices. Examine the vomitus.

If doubt persists give an enema. A negative result does not prove intestinal obstruction, but a negative second enema two hours later is positive evidence.

What is the Treatment of Intestinal Obstruction ?

General measures aim at the replacement of the fluid and chloride lost.

Local measures are by operation. After washing out the stomach (the tube being left in situ in severe cases), the patient is anæsthetised. If the obstruction is in the colon the cæcum will be distended, if in the small bowel the cæcum will be collapsed. If the cæcum is distended and there is no strangulation, in severe cases perform cæcostomy. The cause of the obstruction is sought (if the patient's condition permits in late cases) and dealt with, *e.g.* adhesions divided, volvulus undone, intussusception reduced.

Describe Gall-Stone Ileus.

Gall-stone ileus most commonly occurs in elderly females who have suffered from cholelithiasis. The impacted stone is usually a large one from the gall bladder, which has ulcerated through into the duodenum. The most frequent site of the obstruction is in the lower part of the ileum. The clinical features resemble those already described and help may be obtained from the history and by X-rays. Vomiting is as a rule the most obvious symptom.

The treatment is laparotomy and removal of the stone. If the stone is faceted the chances of another being present must be remembered.

Describe Intussusception.

This is a condition in which one part of the intestinal canal is invaginated into the interior of the part immediately distal to it. The receiving tube or sheath is termed the *intussusciens*; the entering tube and returning tube together are known as the *intussusceptum*. The junction of the entering and returning layers forms the *apex*, whilst the junction of the returning layer with the sheath is called the *neck*. The mesentery enters between the entering and returning layers on the concave side of the intussusception.

What are the Varieties of Intussusception ?

- (a) Entero-colic { Ileo-cæcal.
Ileo-colic.
- (b) Colic.
- (c) Enteric.

Give the Pathology and Morbid Anatomy of Intussusception.

The disease is most common in strong infants suffering from some error in diet or from diarrhœa, and is brought about by exaggerated peristaltic action. A congested Peyer's patch is often the cause of the latter. Owing to the mesenteric vessels which supply the intussusceptum being twisted, the apex becomes œdematous, and the included bowel greatly congested. Extravasation of blood takes place into the walls of the intestine, and also into the lumen. At a later period bacterial infection of the surrounding parts occurs. In untreated cases the included segment of bowel becomes gangrenous; the sheath, in exceptional cases, dies. An intussusception increases at the expense of the outer tube, the apex being a fixed point.

In adults and in most cases of enteric intussusception a small polypoid or ædenomatous tumour is often the cause of the condition.

What are the Clinical Features ?

- (a) Sudden severe spasms of pain coming at intervals.
- (b) Some degree of collapse and the child lies exhausted as the pain passes off in sharp contrast to its screams when the pain is present.

- (c) Usually one normal stool passed and then either (a) the passage of blood-stained mucus, or (b) no further motion.
- (d) The abdomen is not distended and is flaccid.
- (e) On examination it may be possible to feel the sausage-shaped tumour in the transverse or descending colon, and the right iliac fossa may feel empty.
- (f) On rectal examination in a few cases it may be possible to feel the intussusception, but the important point is the presence of blood and mucus on the examining finger.
- (g) The intussusception may be shown by barium enema and it may reduce spontaneously by this manœuvre. Routine X-ray is, however, not advisable.

What is the Treatment ?

Reduction by hydrostatic pressure by enemata is not certain and even under the X-ray screen it may not be possible to confirm complete reduction, therefore operation should be advised. In doubtful cases palpate the abdomen under an anæsthetic and be prepared to operate.

The treatment is—(a) laparotomy ; (b) reduction of the intussusception ; (c) if irreducible and condition of patient permits, resection and anastomosis ; (d) if irreducible and condition poor open sheath and remove intussusceptum.

Describe Mesenteric Thrombosis or Embolism.

Usually the superior mesenteric artery, or one of its colic branches, is the vessel involved. The emboli generally arise from a vegetation on a cardiac valve, or from the walls of an atheromatous aorta. An infective spreading thrombosis may involve the superior mesenteric vein. Mesenteric thrombosis or embolism quickly causes gangrene of the greater part of the bowel.

The leading clinical features are :—

- (a) Shock and vomiting.
- (b) Discharge of thick tarry blood ; followed by absolute constipation.
- (c) Marked tympanites.
- (d) Peritonitis comes on very rapidly.

Prognosis very bad. Treatment by resection if possible.

Describe Volvulus.

Volvulus, in the great majority of cases, occurs in the pelvic colon, for here a long segment of bowel is attached by a very narrow mesentery. The condition may, however, take place in the region of the cæcum, or even in the small intestine. Volvulus results either from the intestine twisting upon its own axis, or from a twisting of the mesentery. The upper segment of the loop is generally rotated so that it passes in front of the lower segment. The condition usually happens suddenly, and is most common in adult males.

What are the Clinical Features?

- (a) Sudden violent abdominal pain.
- (b) Great abdominal distension, in late stages embarrassing the heart and respiration.
- (c) Absolute constipation.
- (d) Shock or collapse.
- (e) Tenderness but no rigidity—usually left iliac fossa.
- (f) Hiccough followed later by vomiting.

Diagnose on history, distension and tenderness.

What is the Treatment?

Laparotomy and reduction is carried out. It may be necessary to resect gangrenous bowel in late cases, but the prognosis is then very bad indeed.

Describe Paralytic Ileus.

This is a form of intestinal obstruction which arises without any interference with the intestinal blood supply and without any mechanical blockage of the gut. It is most frequently encountered in peritonitis, but may follow abdominal operations for injuries.

Following an operation for, *e.g.* perforated appendicitis, the patient is apparently improving and then there is some complaint of tightness of the bandage, there is a certain amount of vomiting and the pulse and temperature do not settle. Later the distension increases, the obstruction becomes complete, and the vomiting becomes faecal and the

general condition grave. The vomiting is typical and large amounts of foul smelling material well up and are vomited without apparent effort.

What is the Treatment ?

Previously the purpose of the treatment was to stimulate the paralysed bowel to contract by the giving of pituitrin or prostigmin, and if that, plus the use of enemata failed, to perform an enterostomy. The best treatment is to secure rest for the intestine and for the patient, to control the vomiting and to restore the fluid and chlorides lost. In brief, this is done by suction drainage (Wangensteen's method) by a duodenal or Miller-Abbott tube and by intravenous saline and glucose. Small amounts of fluid by mouth are permissible. In this way the distended intestine is emptied and placed in the optimum state for recovery.

CHRONIC INTESTINAL OBSTRUCTION.

What are the Causes of Chronic Intestinal Obstruction ?

- | | |
|--|---|
| A. From PRESSURE OUTSIDE THE BOWEL. | <div style="font-size: 4em; vertical-align: middle; padding-right: 10px;">{</div> <div style="display: inline-block; vertical-align: middle;"> (a) Tumours. (b) Peritonic adhesions ; most commonly following tuberculous peritonitis or appendicitis. (c) Tuberculous mesenteric glands. (d) Abnormal " membranes " and " kinks." (?) </div> |
| B. From DISEASE OF THE WALL OF THE BOWEL. | <div style="font-size: 4em; vertical-align: middle; padding-right: 10px;">{</div> <div style="display: inline-block; vertical-align: middle;"> (a) Congenital stenosis. (b) Non-malignant stricture, secondary to ulceration of the mucous membrane. (c) Malignant disease. (d) Diverticulitis. (e) Tuberculous disease. </div> |
| C. From CAUSES IN THE INTERIOR OF THE BOWEL. | <div style="font-size: 4em; vertical-align: middle; padding-right: 10px;">{</div> <div style="display: inline-block; vertical-align: middle;"> (a) Foreign bodies. (b) Enteroliths. (c) Gall-stones. (d) Polypi. </div> |

Give the Varieties of Chronic Intestinal Obstruction.

- (a) Incomplete obstruction.
- (b) Complete obstruction.
- (c) Acute obstruction supervening upon a chronic obstruction.

Describe the Clinical Features of Chronic Intestinal Obstruction.

Incomplete obstruction is first complained of, then either the impaction of a scybalous mass, or foreign body, or even congestion of the mucous membrane is sufficient to close the lumen of the bowel completely.

The signs and symptoms of incomplete obstruction are :—

- (a) Loss of appetite.
- (b) Colicky pain after eating.
- (c) Constipation, often alternating with diarrhœa.
- (d) Slight abdominal distension.
- (e) Sometimes visible peristaltic waves.

When acute obstruction occurs the features are those described above.

In chronic obstruction the treatment is that of the cause, but if acute obstruction has supervened drainage of the bowel or short circuit by anastomosis will be required as a first stage, and the lesion is treated at a second operation when the patient's general condition is satisfactory.

Describe Carcinoma of the Bowel.

Cancer of the bowel is usually a columnar celled carcinoma which infiltrates the submucosa, and in time invades the muscle and serous coats. It is the most common cause of stricture of the large intestine. It does not kill because of its malignancy, but because of the mechanical effects it produces. The tumour may spread locally to involve other organs, *e.g.* the bladder, and this invasion may lead to the formation of fistulæ. The tumour spreads by the lymphatics; in the cæcum and ascending colon to the paracolic glands and to the glands along the ileo-colic and right-colic arteries; in the hepatic flexure to the paracolic glands and those around the middle-colic artery; from the splenic flexure to the paracolic glands and those in relation to the

left-colic artery, which is also the drainage from the descending colon. Metastases may occur in the peritoneum and liver.

The type of tumour varies from (a) the large hypertrophic fungating carcinoma, to (b) the fibrous, sclerosing, annular or ring stricture and (c) the malignant polypus or malignant ulcer. The first type is usually found in the cæcum, the second in the transverse, descending and pelvic colons, and the last type in the rectum.

The intestine above the tumour becomes dilated and its mucosa shows chronic inflammatory and catarrhal changes with the formation of stercoral ulcers.

What are the Clinical Features ?

The signs and symptoms are those of chronic obstruction with, in addition—

- (a) Melæna.
- (b) Mucus in the stools. Sometimes alternating diarrhœa and constipation.
- (c) The tumour may be palpable.
- (d) In late cases there may be pain shooting to the loins or down the back of the thighs.
- (e) The tumour is diagnosed by the X-ray findings following a barium enema, and in tumours at a low level by sigmoidoscopy.

What is the Treatment ?

Acute obstruction has already been discussed.

When the patient's general condition is satisfactory (blood transfusion often required) operation is advised. This may be a formal resection, *e.g.* right hemicolectomy with anastomosis or it may be done by the Mickulicz-Paul method which exteriorises the tumour after bringing the upper and lower loops together, and later the closure of the fistula by the application of an enterotube. Details will be found in *Operative Surgery*.

Describe Diverticulosis and Diverticulitis.

This condition most commonly occurs in men over the age of forty and is due to the herniation of small pouches of

mucous membrane through the muscle coat at the weak points caused by the passage of the blood vessels, and is probably due to the strain of chronic constipation. The diverticula are saccular in type and readily become filled with fæces, but emptying is less easy and therefore infection is likely to occur. The pelvic colon is the most frequent site of the disease, but no part of the colon is exempt from it. The disease may be present without symptoms—diverticulosis or inflammatory changes may have supervened—diverticulitis.

With infection an inflammatory mass may form which becomes adherent to the parietes or to neighbouring viscera, *e.g.* the bladder, and a localised abscess or a fistula may form. Should perforation occur before the formation of adhesions peritonitis will follow.

In acute inflammation the clinical picture is that of left-sided appendicitis; in chronic cases there is pain, constipation with the passage of mucus and sometimes diarrhœa. There is a painful, tender swelling in the left iliac fossa. The condition is well shown by films taken after the evacuation of a barium enema.

The treatment should be medical and operation advised only if this has failed or if complications have occurred.

Mention the Varieties of Intestinal Tuberculosis.

- (a) Acute and destructive.
- (b) Chronic and formative.

The former is secondary to phthisis, and characterised by widespread ulcers; clinically diarrhœa is present. The chronic variety is rarer and in many cases not associated with phthisis. It is a hyperplastic pericolitis, and accompanied by constipation.

Give the Pathology.

Intestinal tuberculosis is most common in the ileo-cæcal region. The bacilli reach the part either from swallowed sputum, or as a hæmatogenous or lymphatic infection. Nodules appear in the submucous and subserous coats which enlarge and coalesce. They rupture on the mucous membranes causing ulcers to form which pass transversely round

the bowel. Perforation is exceptionally rare owing to the formation of fibrous tissue. The wall of the bowel becomes thickened, firm and nodular. The paracolic glands are often enlarged. Localised patches of tuberculous peritonitis are generally found opposite the bases of the ulcers.

What are the Clinical Features of the Chronic Form ?

The condition may simulate either appendicitis or carcinoma of the bowel. The main signs are :—

- (a) Constipation alternating with diarrhœa.
- (b) Colicky pains.
- (c) Swelling in the right iliac fossa, usually tender on pressure.
- (d) Barium enema shows the drawing up of the cæcum and the presence of chronic obstruction.

If possible the affected bowel is excised and if this cannot be done the area is short circuited.

A similar condition due to non-specific infection occurs in young subjects in the lower ileum. The symptoms are similar and the treatment is by excision. As the cause is unknown the disease is referred to as regional ileitis (Crohn's disease).

VERMIFORM APPENDIX.

Briefly describe the Anatomy of the Vermiform Appendix.

Normally the vermiform appendix springs from the postero-internal aspect of the cæcum, its origin being represented on the body surface by Lanz's point. The appendix is a narrow tube about $3\frac{1}{2}$ inches in length, connected to the mesentery by the meso-appendix. Its blood supply is derived from a branch of the ileo-colic artery. Guarding the orifice of the appendix is a small valve—the valve of Gerlach. In young persons the submucous coat is exceedingly rich in lymphoid tissue. The apex most commonly assumes one of three positions : (a) retro-cæcal, (b) pelvic, in females forming an anterior relation of the right ovary ;

or (c) retro-iliac, passing upwards and to the left behind the terminal portion of the ileum.

What are the Pathological Features of Acute Appendicitis?

Acute appendicitis must be considered in two groups—(a) appendicular obstruction, and (b) appendicitis.

If the appendix becomes obstructed by a concretion, by a foreign body, or by kinking or some other cause the portion distal to the obstruction cannot empty itself into the cæcum. Colicky pain is produced and the distal portion becomes distended. The course of the disease now depends on the virulence and amount of the infection of the contents of the appendix. If infection is considerable the appendicular wall is eroded and the appendix becomes full of pus. The increase of tension is rapid and is sufficient to cut off the blood supply and gangrene occurs within a short time. Perforation follows very early, long before protective adhesions have formed, and there is a sudden flooding of the peritoneal cavity with a virulent infection. If infection is less marked or if the obstruction is incomplete the progress is not so rapid and in the presence of a very mild infection a large mucocoele of the appendix may be formed.

Acute appendicitis without obstruction is due to infection of the appendicular wall by organisms, chiefly the bacillus coli and the streptococcus. The infection may be blood-borne and it is most common in males between the ages of twelve and thirty. The inflammation begins in the mucous coat and spreads to the submucous coat. The lumen contains muco-pus and desquamated epithelium. Provided that the organ has free drainage into the cæcum the process is relatively slow. The inflammation may subside leaving the appendix wall the site of fibrosis and there will be stenosis of the lumen. If the inflammation continues it involves the other coats and its outer surface becomes covered with lymph. The omentum may wall off the organ or inflammatory adhesions may form so that when perforation occurs it tends to do so into a localised area and an appendicular abscess will be formed. Such an abscess will be found medial to, posterior to, or lateral to the cæcum or in the pelvis. The abscess may rupture and cause general peritonitis.

What are the Clinical Features of Acute Appendicitis?

- (a) Vague abdominal pain referred to the umbilicus, becoming more severe and, after an interval, passing to the right iliac fossa.
- (b) Nausea and often vomiting.
- (c) Tenderness in the right iliac fossa, most marked over McBurney's point (*i.e.* the junction of the outer and middle thirds of a line joining the right anterior superior iliac spine to the umbilicus). The site of tenderness is frequently more lateral and even in the loin in retro-caecal cases, and is lower in pelvic appendicitis.
- (d) Rigidity or guarding in the right iliac fossa.
- (e) Hyperæsthesia corresponding to Sherren's triangle
- (f) Temperature and pulse may be raised. Never say this is not appendicitis because the temperature is normal.
- (g) Constipation, but there may be diarrhœa and passage of mucus in pelvic cases.
- (h) Frequency of micturition with pain at end of act in pelvic cases.
- (i) Rectal examination reveals tenderness in the pelvic type of appendix and may reveal an abscess not otherwise palpable.
- (j) Various tests such as the psoas, opposite-sided test and obturator tests are of doubtful value.
- (k) Beware of and always remember the colicky type of pain and the apparently trivial findings in some cases of acute appendicular obstruction.

From what other Conditions must Appendicitis be diagnosed?

- (a) Perforation of a gastric or duodenal ulcer.
- (b) Cholecystitis.
- (c) Acute intestinal obstruction.
- (d) Pneumonia.
- (e) Diaphragmatic pleurisy.
- (f) Diverticulitis (*i.e.* inflammation of a Meckel's diverticulum).
- (g) Typhoid fever.
- (h) Intestinal colic.

- (i) Pelvic peritonitis.
- (j) Rupture of an ectopic gestation.
- (h) Cancer of the cæcum.

Give the Treatment.

If the diagnosis is acute appendicitis the treatment is emergency operation. Delay may be fatal and there is no place for expectant treatment in uncomplicated appendicitis. The appendix is removed.

What are the Complications of Acute Appendicitis ?

- (a) Peritonitis—may be localised or generalised (p. 144).
- (b) Pelvic abscess.
- (c) Sub-phrenic abscess (p. 150).
- (d) Paralytic ileus (p. 186).
- (e) Fæcal fistula.
- (f) Pyelo-phlebitis, *i.e.* portal pyæmia.

Describe Appendicular Abscess.

After a history lasting usually over forty-eight hours the symptoms may have subsided, but the patient complains of tenderness in the right iliac fossa and the temperature and pulse are elevated. If the appendix be retrocæcal in position the abscess may be palpable as a rounded swelling through the guarded muscles. Pelvic abscesses are associated with diarrhœa and the passage of mucus and are identified by rectal examination. The diagnosis is usually easy.

There are two schools of thought in the treatment—(a) delayed or expectant treatment : (b) operation.

Delayed treatment should never be adopted in children and must be given up if the abscess is not subsiding. Operation consists of drainage of the abscess, the appendix only being removed if it can be easily seen and easily separated from the abscess wall. If drainage is adopted the appendix should be removed after an interval of about six months.

What is Chronic Appendicitis ?

This term is loosely applied and is used to include the appendices operated on following an acute attack—interval

appendicectomy and two different syndromes—(a) mild attacks of typical appendicitis recurring at intervals and having the features of the acute type without additional signs ; (b) the so-called appendicular dyspepsia, *i.e.* pain often referred to as indigestion coming on immediately after food, associated with constipation and lasting for irregular intervals with periods of complete freedom from symptoms. The diagnosis may be difficult and X-ray is of little help. The treatment is appendicectomy.

THE LIVER.

Describe Rupture of the Liver.

Rupture of the liver often results from severe violence applied to the anterior abdominal wall, or from falling from a height. Both Glisson's capsule and the glandular tissue are torn. Owing to the profuse hæmorrhage into the peritoneal cavity, the injury is usually fatal.

Give the Signs and Symptoms.

- (a) Signs of shock and internal hæmorrhage.
- (b) Marked tenderness in the right hypochondrium and epigastrium.
- (c) Frequent attacks of pain shooting to the right infra-scapular region.
- (d) Rigidity of the right rectus muscle.

What is the Treatment ?

In order to treat the condition make a vertical incision in the middle line above the umbilicus and expose the liver. Grasp the free margin of the lesser omentum between the finger and thumb, thus controlling the hepatic artery and portal vein, and endeavour to check the hæmorrhage. Tie any visible bleeding vessels and suture the rent with thick catgut stitches.

Describe Abscess of the Liver.

Abscesses of the liver may be divided into two groups, pyogenic and tropical. The former may arise from the

perforation of a gastric ulcer, appendicitis, or as part of a general pyæmia. In pyæmia the portal vein becomes inflamed (suppurative pyelo-phlebitis), several septic emboli are detached and lodged in the liver. Tropical abscess is secondary to amœbic dysentery, the amœba coli travelling along the radicles of the portal system to the liver. Hepatic abscesses are usually situated in the right lobe.

A tropical abscess consists of three zones.

OUTER = Hyperæmic liver tissue.

MIDDLE = Necrotic liver tissue.

INNER = Pus, somewhat resembling anchovy paste.

When untreated, the abscess often bursts into the right lung.

Give the Clinical Features of Amœbic (Tropical) Abscess.

- (a) Pain in the right hypochondrium, radiating towards the right shoulder.
- (b) Febrile disturbances, with frequent rigors and profuse sweating.
- (c) Enlargement of the liver, often bulging the thoracic wall, and displacing the diaphragm upwards.
- (d) Progressive loss of weight.
- (e) Jaundice is usually absent.
- (f) Ascites may develop.
- (g) The abscess may burst into (i) the hepatic flexure of the colon, (ii) the stomach, or (iii) the right bronchus, and thus the characteristic pus may be passed with the stools, or vomited, or expectorated.

Similar features may be present in amœbic hepatitis before the abscess has formed and X-ray may be helpful in the diagnosis. Elevation of the diaphragm with loss of movement, enlargement of the liver shadow, and in a few cases the actual local prominence of the abscess may be seen.

Treat by intramuscular emetine gr. i or emetine bismuth iodide gr. 3 by mouth. If condition does not subside confirm presence of abscess by aspiration. Abscess may be drained by anterior route, lateral, transpleural or posterior methods.

Describe Cancer of the Liver.

Primary cancer of the liver is rare. It is usually difficult to diagnose and its surgical treatment almost impossible. The chief signs and symptoms are :—

- (a) Irregular and rapid enlargement of the liver.
- (b) The organ is nodular.
- (c) Rapid failure of health.
- (d) Absence of fever and rigors.
- (e) Jaundice.
- (f) No attacks of biliary colic.

Secondary carcinoma mainly follows disease of the mammary gland, stomach, pelvic colon, and rectum.

THE GALL BLADDER AND BILE DUCTS.

How would you examine a case with Gall Bladder symptoms ?

Take careful history of—

- (a) Dyspepsia ; type, frequency, effect of various foods, *e.g.* starchy and fatty foods.
- (b) Pain ; radiation to the back or shoulder.
- (c) Jaundice.
- (d) Clinical examination for (i) hyperæsthesia, (ii) tenderness, (iii) palpable gall bladder, (iv) crepitations at right base, (v) jaundice.
- (e) Icterus index and Van der Bergh test if jaundice present.
- (f) Straight X-ray for opaque calculus.
- (g) Cholecystography.
- (h) Lyon's duodenal intubation.

Describe Cholecystography.

The gall bladder may be visualised by the absorption of an iodine containing compound which is excreted by the bile and concentrated in the gall bladder. The first substance employed was sodium tetraiodophenolphthalein (S.T.I.P.P.) which was injected intravenously. This was not without danger and oral methods are now in use either

by giving S.T.I.P.P. in keratin capsules or proprietary preparations such as opacol.

Failure to show a shadow may be due to :—

- (a) The dye has not been absorbed.
- (b) Disease of the gall bladder.
- (c) Blockage of the cystic duct.

A normal gall bladder shows a shadow which is regular in outline. A non-opaque calculus will be revealed as a filling defect and in cases of multiple non-opaque calculi they may be outlined by the S.T.I.P.P.

What are the Features of a distended Gall Bladder ?

Distension of the gall bladder leads to the formation of a smooth rounded swelling in the right hypochondrium, in the vicinity of the ninth costal cartilage, and along the outer edge of the right rectus muscle. The swelling accompanies the liver in its respiratory movements.

Describe Acute Cholecystitis.

Theoretically organisms may reach the gall bladder by (a) the blood stream, (b) by the lymphatics, (c) by the bile, (d) by ascending infection along the ducts. The organisms found in the gall bladder wall are usually streptococci, but bacillus coli may also be found. Typhoid bacilli are found in typhoid carriers without any evidence of acute cholecystitis. It is a disease of adult life and varies in severity from an acute gangrene to a catarrh of the gall bladder wall. Blockage of the cystic duct may lead to empyema of the gall bladder or to rapidly increasing distension and gangrene. Should the infection be a mild one a mucocele may develop instead of an empyema.

The clinical features are :—

- (a) Pain in right hypochondrium. It is persistent with exacerbations.
- (b) Rise of temperature and pulse.
- (c) Vomiting and constipation.
- (d) Palpable acutely tender mass as described above.

Later contact with the parietal peritoneum or leakage may give symptoms and signs of peritonitis.

What is the Treatment ?

In poor surgical risks conservative treatment by rest in bed in Fowler's position, fluids only and relief of pain by morphia and local heat may be safely carried out, provided that the patient is under constant supervision.

Operation is indicated in suitable subjects and if possible the gall bladder is removed. Drainage of the gall bladder will tide the patient over but cholecystectomy will probably be required later.

What is Chronic Cholecystitis ?

Following acute cholecystitis the gall bladder wall may become thickened and fibrosed with increased subserous fat and areas of mucosal loss. The disease may also arise *de novo* and in many cases is associated with gall stones. It affects the same type of patient as gall stones and the symptoms are similar, viz. flatulent dyspepsia. In some cases the gall bladder mucosa is reddened and studded with white spots containing cholesterol—the strawberry gall bladder or cholesterosis of the gall bladder.

The gall bladder should be removed.

Describe Gall Stones.

The exact etiology of gall stones is not known, but it cannot be doubted that the factors of importance are infection, disorders of cholesterol metabolism as in pregnancy, and factors increasing the production of pigment, *e.g.* acholuric jaundice. The pure cholesterol stone may be of large size and may occur without infection, but should this occur a mixed stone will be produced by the deposition of calcium salts.

The physical and chemical characters are :—

Colour.—Whitish when composed of calcium salts, greenish or brownish depending on the proportion of bile pigments.

Consistence.—Usually hard.

Shape.—Ovoid when single ; angular and faceted when multiple.

X-rays.—Usually non-opaque or casting only a thin shadow.

Composition.—Single stones usually pure cholesterin; multiple stones are mixed stones or pure pigment stones.

What are the Clinical Features ?

The type of patient is aptly described as the fair, fat, fertile, female of forty. The symptoms, as in chronic cholecystitis, are those of flatulent dyspepsia, *i.e.* the patient complains of pain, distension and flatulence at irregular intervals after food. The pain is not relieved by alkalis and is made worse by fatty and starchy foods. Ordinary clinical examination may be negative or slight tenderness may be present. Investigation will clinch the diagnosis and the treatment is cholecystectomy.

What are the Clinical Features of Stone in the Cystic Duct ?

A stone may become lodged in Hartmann's pouch or enter the cystic duct. The symptoms and signs are :—

- (a) Attacks of biliary colic with the pain shooting towards the right shoulder.
- (b) Tenderness over the gall bladder, *i.e.* over the tip of the ninth rib on the right side.
- (c) Press the fingers over the gall bladder, and ask the patient to take a deep breath—inspiration is suddenly checked.
- (d) Transient and slight attacks of jaundice.
- (e) Distended gall bladder ; in old-standing cases the gall bladder is often contracted.

Should the stone fall back into the gall bladder the condition will subside, if it becomes impacted empyema or mucocele will follow and if it should pass on it will give rise to the features of stone in the common duct.

What are the Clinical Features of a Calculus in the Common Bile-Duct ?

- (a) Attacks of biliary colic, with the pain shooting through to the back.

- (b) Tenderness over an area midway between the umbilicus and the ensiform cartilage.
- (c) Persistent jaundice, intensified after each attack of colic.
- (d) Contracted gall bladder.
- (e) Intermittent feverish attacks with rigors, and loss of weight and strength (cholangitis).
- (f) An excess of total unabsorbed fat in the stools.
- (g) Stercobilin is present in the fæces.

The treatment is to remove the stone by choledochotomy. The presence of white bile due to a complete and sudden obstruction is a bad prognostic sign.

What is Courvoisier's Law ?

Courvoisier's law states that in cases of chronic jaundice, due to obstruction of the common bile-duct, a contracted gall bladder signifies that the obstruction is due to stone ; a dilatation of the gall bladder, that the obstruction is due to causes other than stone.

Mention the Clinical Features of a Stone impacted in Vater's Ampulla.

When the stone is impacted in Vater's ampulla, in addition to the obstruction of the flow of bile, there will be obstruction to the pancreatic juice. The fæces will be :—

- (a) Acid in reaction.
- (b) Bulky, greasy, and offensive in odour.
- (c) Contain a large amount of undigested fat.
- (d) Contain fragments of undigested muscle fibres.

These are recognised on microscopical examination.

What is meant by the Term Cholangitis ?

Cholangitis is a septic catarrhal inflammation of the common bile-duct, resulting from (a) a biliary calculus ; (b) hydatid disease ; (c) ascarides : or (d) cancer of the bile-ducts. The epithelium of the duct necroses in patches, leaving small ulcers. In advanced cases perforation may occur, and a stone may escape into either the peritoneal cavity or into a mass of peritoneal adhesions.

Give the Symptoms and Treatment.

The signs and symptoms are :—

- (a) Progressive enlargement of the whole liver, the organ being tender and free from nodules.
- (b) Persistent jaundice.
- (c) Rigors, sweating, pyrexia.
- (d) Rapid emaciation and collapse.

In the acute stage treatment is of little value, but in less acute cases choledochotomy, removal of stones and drainage of the ducts is indicated.

Describe an Attack of Biliary Colic.

The patient is seized with sharp pains in the hepatic region ; these radiate towards the right shoulder. Rigors are common ; the sufferer is markedly collapsed and sweats profusely. The pulse is rapid and feeble. Vomiting is a distressing feature. The attack may be followed by a transitory jaundice.

Rest, morphine and hot applications are usually sufficient. Later the patient is investigated and appropriate treatment given.

Give the Features of Cancer of the Gall Bladder.

Cancer of the gall bladder usually follows the prolonged irritation of biliary calculi. It is a columnar-celled carcinoma. The chief clinical features are :—

- (a) A rapidly-growing swelling beneath the right costal margin.
- (b) Paroxysmal pain radiating towards the right scapular region ; the pain is usually much worse during the night.
- (c) The tumour descends when the patient takes a deep inspiration. This sign is absent when adhesions have formed.
- (d) The swelling feels intensely hard ; it is not tender on palpation.
- (e) Jaundice may occur.
- (f) Ascites may develop in advanced stages.

Operation is indicated and, if possible, the tumour and a V-shaped area of liver are removed.

THE PANCREAS.

Describe Inflammation of the Pancreas.

Three varieties of pancreatitis may be met with—acute, sub-acute, and chronic. They are all due to some septic process, the bacteria reaching the pancreas either by extension along the duct, the blood stream, or the lymphatics. Cholecystitis (inflammation of the gall bladder) and cholangitis (inflammation of the common bile-duct), or gastro-duodenal catarrh, usually precede the pancreatitis.

Give the Clinical Features of Acute Pancreatitis.

The signs and symptoms of acute pancreatitis closely resemble those of a perforated gastric or duodenal ulcer, or of acute intestinal obstruction. They are :—

- (a) Sudden attack of agonising pain in the epigastric region.
- (b) Marked tenderness in the epigastrium.
- (c) Persistent vomiting.
- (d) Slight rise of temperature.
- (e) A circumscribed epigastric swelling.
- (f) Collapse and cyanosis.
- (g) Often rigidity of the upper segments of the recti muscles.

Hæmorrhagic areas are found in the organ along with fat necrosis in the neighbouring sub-peritoneal fat. The inflammation of the pancreas leads to a certain amount of leakage of the fat-splitting ferment, *steapsin*, which converts the fat into crystalline fatty acids and glycerin. Calcium salts unite with the fatty acids to form white, opaque, glistening areas. The glycerin is ultimately absorbed.

The prognosis of acute pancreatis is very grave.

Describe Sub-Acute Pancreatitis.

After an illness of two or three days' duration, suppuration occurs in the gland, and one or more abscesses form. The clinical features are :—

- (a) Irregular temperature.
- (b) Fever of a hectic type.

- (c) Asthenia and loss of weight.
- (d) Marked diarrhœa.
- (e) Fœtid stools containing pus.

What is the Treatment ?

Laparotomy is performed, the pancreas incised and drained and free drainage of the biliary system secured by choledochostomy.

Give the Pathology of Chronic Pancreatitis.

Chronic pancreatitis is manifested by a hyperplasia of the interlobular or the periacinar connective tissue of the organ. The disease may terminate in cirrhosis. The head of the gland is the part most frequently affected ; it is swollen, hard to the touch, and distinctly lobulated. Chronic pancreatitis is usually secondary to a biliary calculus obstructing the outflow of the pancreatic juice. It may, however, follow gastric and duodenal catarrh or ulceration.

Mention the Clinical Features.

- (a) Anorexia and progressive loss of weight.
- (b) Gastric derangements, *e.g.* flatulence, heartburn, etc.
- (c) Fæces are bulky, greasy ("butter") stools, and offensive in the late stages.
- (d) Fæces are acid in reaction.
- (e) Absence of trypsin in the stools.
- (f) Fulness in upper part of abdomen.

The treatment is medical, but if this fails some surgeons advise cholecystgastrostomy (anastomosis of gall bladder to stomach).

What is the Lœwes Test for a Pancreatic Lesion ?

Two or three drops of a freshly prepared 1-1000 solution of adrenalin are dropped into the conjunctival sac and the process repeated in five minutes. In pancreatic disease this procedure is usually followed by dilatation of the pupil. The test is of doubtful value.

Describe Cancer of the Pancreas.

Malignant disease of the pancreas usually affects the head of the viscus. It is a carcinoma with abundant fibrosis and is of relatively slow growth. It kills because of its situation rather than its malignancy.

The clinical features are :—

- (a) Gradual onset with failing health.
- (b) Painless and progressive jaundice.
- (c) Gall bladder usually distended.
- (d) Signs of pancreatic deficiency in stools.

The only possible treatment is palliative by cholecyst-gastrostomy.

Classify Cysts of the Pancreas.

Cysts of the pancreas are classified as—

- (a) *False or Traumatic.*
- (b) *True.* $\left\{ \begin{array}{l} \text{(i) Retention.} \\ \text{(ii) Inflammatory.} \\ \text{(iii) Adenomatous.} \end{array} \right.$

False cysts follow trauma of the upper part of the abdomen. They are collections of fluid in the lesser peritoneal sac (omental bursa). The contents are turbid, brownish in colour, and given an alkaline reaction containing ferments and albumin.

True cysts are either unilocular or multilocular. They may rupture into the lesser sac, and thus simulate false cysts.

Mention the Clinical Features.

- (a) A rounded, fluctuating swelling, which is slightly movable.
- (b) It is situated immediately above the umbilicus, to one or other side of the middle line.
- (c) On percussion, a central area of dulness, with a zone of resonance around. This feature is only present when the cyst is between the stomach and the transverse colon.

The cyst may be found in one of three positions :—

- (i) Between the stomach and the transverse colon.
 - (ii) Between the stomach and the liver.
 - (iii) Between the layers of the meso-colon.
- (d) Pressure symptoms on stomach, diaphragm, transverse colon, or common bile-duct.
- (e) Marked loss of weight.

What is the Treatment ?

Laparotomy will in many cases be required for diagnosis as well as treatment. If possible the cyst is excised, if impossible it is stitched to the parietes and drained (marsupialisation of the cyst).

THE SPLEEN.

Describe Rupture of the Spleen.

The spleen is frequently ruptured from severe violence applied to the left hypochondrium ; often the stomach and the adjacent costal wall are damaged at the same time. In individuals who have suffered from malaria, the spleen may be ruptured from very slight violence.

Give the Clinical Features.

- (a) Marked shock.
- (b) Cramp-like abdominal pains.
- (c) Signs of internal hæmorrhage.
- (d) Dulness gradually developing on the left side of the abdomen.
- (e) An increase in the splenic dulness.

An immediate laparotomy should be undertaken. Control the hæmorrhage by digitally compressing the splenic pedicle which is formed by the lienorenal ligament. In

simple rupture, close the rent by deep catgut sutures ; in extensive lacerations, remove the spleen (splenectomy).

Describe a Movable Spleen.

A movable or displaced spleen generally occurs in women suffering from enteroptosis (Glenard's disease). The organ is usually completely prolapsed below the costal margin ; in advanced cases it has been recognised in the pelvis, and mistaken for an ovarian tumour. In the majority of instances the spleen is enlarged. Attacks of perisplenitis may fix the viscus in an abnormal situation.

What are the Clinical Features ?

Usually the patient complains of—

- (a) Dragging, uneasy pains on the left side.
- (b) Neurasthenic symptoms.
- (c) Violent pain, swelling of the left flank, and marked rise of temperature indicate torsion of the pedicle. Necrosis then generally results.

The spleen can be identified by its shape, and by its notched anterior margin.

Give the Treatment.

When the symptoms of torsion of the pedicle arise, a laparotomy is performed, and the organ excised. In mild cases, with vague neurasthenic symptoms, a suitable belt can be worn. Failing this, splenectomy should be undertaken.

Describe Splenic Tumours.

Hydatid cysts may occur ; also secondary cancer and sarcoma. Primary lympho-sarcoma is sometimes found. A sarcoma forms a hard, irregular tumour which grows rapidly. Later, when the peritoneum becomes affected, pain in the left side is complained of. Sometimes leucocytosis with eosinophilia is present. The patient loses

weight and suffers from cachexia. As metastasis is early, prompt removal of the organ is indicated.

What are the other indications for Splenectomy?

(a) Acholuric jaundice; (b) Purpura hæmorrhagica; (c) Early cases of Bantis' disease.

RECTUM AND ANAL CANAL.

Give a brief account of the Development of the Rectum and Anal Canal.

The rectum and the upper part of the anal canal develop from the caudal portion of the hind-gut, *i.e.* the entodermal cloaca, while the lower area of the anal canal arises from the proctodæum or ectodermal cloaca, a shallow pit immediately in front of the tail-fold. The cloacal membrane separates the proctodæum from the hind-gut; normally it breaks down during the second month of foetal life. By the subsequent ingrowth and fusion of two lateral folds, the entodermal cloaca is divided into two compartments:—a ventral one, the urogenital sinus, and a dorsal one, the rectum. The urogenital sinus forms the trigone of the bladder and the upper part of the urethra in the male; in females it becomes the trigone of the bladder, urethra, and vestibule of the vagina.

What are the Anatomical Features of Surgical Importance?

The rectum begins at the level of the third piece of the sacrum and ends by becoming the anal canal where the lining becomes squamous epithelium, that of the rectum being columnar epithelium with mucus cells. The upper third of the rectum is covered by peritoneum anteriorly and laterally, the middle third anteriorly only and the lower third is not related to peritoneum.

The blood supply of the rectum is from the superior, middle and inferior hæmorrhoidal arteries. The superior

hæmorrhoidal veins join the portal and the others the systemic circulation. The lymphatics of the rectum pass to the glands in the hollow of the sacrum, in the pelvic mesocolon along the mesenteric artery and to the aortic glands. The lymphatics of the anal canal pass to the inguinal glands.

The anus is guarded by the external sphincter, a voluntary muscle, and by the internal sphincter, which is a thickening of the middle coat of the gut and is an involuntary muscle.

At the junction between anus and rectum some twelve processes pass upwards. They are the columns of Morgagni and the intervening hollows are the crypts of Morgagni. Above this there are three mucosal folds known as the valves of Houston.

What methods are used in the examination of the Rectum and Anus?

Inspection reveals the presence of fissure, fistula, prolapsed hæmorrhoids.

Palpation.—The gloved finger, well lubricated, is gently inserted and can ascertain (a) the tone of the sphincters; (b) the presence of tumours or lesions of the rectal wall; (c) abnormalities of accessible viscera, e.g. uterus, prostate, seminal vesicles and the pouch of Douglas.

Instrumental Inspection.—The anus and lower rectum are inspected by means of a proctoscope and the rectum and lower colon by the sigmoidoscope.

X-Ray, after the administration of an opaque enema, is of more value in the upper parts of the colon.

Describe the Congenital Malformations.

These are of two kinds :—(a) failure of complete development; (b) abnormal communications with other viscera.

Imperforate Anus varies from complete absence of the rectum, the bowel ending blindly in the peritoneal cavity, to a persistence of the cloacal membrane. An intermediate type is due to failure of development of the proctodæum. Whatever the type, the failure to pass meconium and the signs of intestinal obstruction are present. Inspection of the perineum reveals the presence or absence of the anus

and the sphincters. A straight X-ray film in the Trendelenburg position will reveal the level of the blind end of the gut outlined by gas.

Treatment is to establish the continuity of the bowel if the sphincters are present and in other cases colostomy is performed.

Abnormal Communications may exist between the rectum and bladder or urethra in the male and bladder or vagina in the female. In the case of recto-vaginal fistula treatment may be deferred, but fistulous openings into the urinary tract call for early colostomy to prevent serious infection.

Describe Pruritus Ani.

Pruritus of the anus is brought about by local irritation, especially eczema, pediculi, oxyuris vermicularis, and hæmorrhoids. It may also be secondary to pruritus vulvæ.

The condition causes great discomfort and annoyance, especially at night, when the intense itching often leads to insomnia.

The treatment consists in removing any local cause, keeping the parts clean, and applying soothing and astringent ointments. If these measures fail, X-ray therapy should be employed.

Describe Acute Proctitis.

Acute proctitis or inflammation of the rectum may be due to (a) the presence of a foreign body ; (b) hæmorrhoids ; (c) stricture ; (d) dysentery ; (e) trauma, either from within or without ; (f) gonorrhœa, especially in females ; (g) syphilis.

Give the Signs and Symptoms.

- (a) Severe burning pain and tenesmus.
- (b) Acrid discharge from the anus.
- (c) Passage of bloody stools containing a large quantity of mucus.
- (d) Reflex irritation of the bladder.

- (e) On digital examination, the lower part of the bowel is greatly injected and hot to the touch.
- (f) Marked constitutional symptoms.

What is the Treatment ?

Deal with the cause if that is possible, *e.g.* dysentery. The patient is kept in bed and the pain is relieved by hot hip baths. Mild aperients and swabbing or irrigation with weak solutions of silver nitrate are employed. Morphine suppositories are frequently necessary for the relief of pain. Ulceration occurs in dysentery, tuberculosis and syphilis, and if local measures do not secure healing it may be necessary to rest the part by a temporary colostomy.

Describe Fissure in Ano.

An anal fissure is a small crack in the mucous membrane partially concealed within the anal folds. It may only implicate the mucous membrane, or may burrow so deeply as to involve the external sphincter. The fissure occurs in the lower part of the anal canal, rarely extending upwards beyond the pectinate line (white line of Hilton). The condition is more common in females than in males, and is usually found in adults. In outline the ulcer is pear-shaped with the base downwards, and the lower end is generally guarded by an œdematous fleshy tag, resulting from a torn anal valve—the sentinel pile of Brodie. When recent, the fissure is of a florid colour and elastic ; in old cases it is grey and indurated.

What is the Etiology ?

Anal fissure may result from (a) polypi or hæmorrhoids ; (b) chronic constipation—a hard fæcal mass tearing one of the anal valves.

Give the Clinical Features.

The patient complains of agonising pain during defæcation and after the act. The pain may be reflected down the

thighs, simulating sciatica : reflex increase of micturition often occurs. A little blood is usually passed with the motions. The general health deteriorates.

On examination it will be found that the anal orifice is firmly closed and puckered (a very suggestive sign), and an anæsthetic will be necessary previous to any digital exploration. The edges of the ulcer are raised and hard, the fissure feeling like a "button-hole."

Describe the Treatment.

In slight cases the use of an emolient ointment and the regulation of the bowels by liquid paraffin will suffice. In more severe cases ointment containing percaïne or cocaine is of value, but the local infiltration of oily anæsthetics such as A.B.A. or proctocaine is more certain. In cases of marked chronicity the sphincter is stretched under anæsthesia and the fissure is excised along with the sentinel pile.

Describe Prolapse of the Rectum.

Two varieties occur, namely (a) *incomplete*, where only the mucous membrane is protruded, and (b) *complete*, procidentia recti, where all the coats of the bowel take part in the prolapse.

Normally during defæcation the anal mucous membrane is everted, and when this becomes exaggerated, prolapse is induced. Rectal prolapse is most apt to take place at the extremes of life, as at these periods the pelvic diaphragm is naturally weak and lax. In children, the protrusion is generally of the incomplete variety ; in adults, procidentia is the commoner condition.

Give the Cause of Prolapse.

In order to bring about prolapse, two factors are necessary—(a) long-continued straining, and (b) weakness of the pelvic floor. Common causes of prolapse are :—

- (a) Constipation or diarrhœa.
- (b) Phimosis.

- (c) Vesical or urethral calculus.
- (d) Enlarged prostate.
- (e) Stricture of urethra.
- (f) *Oxyuris vermicularis*.
- (g) Rectal polypi.
- (h) Hæmorrhoids.
- (i) Carcinoma of the rectum.

In females, repeated pregnancies may materially weaken the pelvic floor, and thus act as an important predisposing cause.

What are the Clinical Features ?

At first the prolapse is only slight, occurs during defæcation, and returns spontaneously. Later, as it becomes larger, it may protrude independently of defæcation, and require digital reduction.

The anal orifice is patulous owing to the stretching of the external sphincter. In old-standing cases the protruded segment becomes covered with stratified epithelium, and is very liable to undergo ulceration.

A rectal prolapse must be diagnosed from an intussusception protruding from the anus. The chief points of difference are (a) in prolapse the mucous membrane of the swelling is continuous with the perianal skin; and (b) in intussusception the surgeon's finger can be introduced along the side of the swelling into the cavity of the rectum.

The clinical features of intussusception are such that no confusion should arise in differentiating between the two conditions.

How is Prolapse Treated ?

In children the condition usually yields to non-operative treatment. Return the prolapse by gently pushing it back. In large swellings reduce the central part first. To prevent redisplacement, strap together the nates with a broad piece of adhesive plaster.

With regard to the after-treatment, it is essential to avoid constipation, and to persuade the child to defæcate when

lying on its side. The cause is then eliminated if that is possible. In cases which do not respond to these simple measures a sub-cutaneous loop of silver wire temporarily inserted is of value. In adults the injection of alcohol or sodium morrhuate into the hollow of the sacrum and the ischio-rectal fossæ may be tried, but in severe cases operation is required.

HAEMORRHOIDS OR PILES.

Give the Pathology of Hæmorrhoids.

The main anatomical facts leading to the production of hæmorrhoids are :—

(a) The stagnant circulation in the hæmorrhoidal plexus ; (b) the dependent position of the veins ; (c) the absence of valves in the portal system, hence any congestion causes distension of the hæmorrhoidal veins ; (d) the veins are embedded in a lax submucous tissue ; (e) the passage of the superior hæmorrhoidal veins through the muscular layer of the rectum ; and (f) the frequent distension of the ampulla with fæcal contents materially retards the venous return.

Piles are classified into two groups—internal and external. An internal pile consists of a number of dilated venules, matted together by a variable amount of connective tissue, and covered by mucous membrane. In many cases small arteries can be detected coursing through the connective tissue.

External piles are either (a) hypertrophied tags of integument, “dog-ear” piles ; or (b) dilated perianal veins (tributaries of the inferior hæmorrhoidal) ; or (c) small hæmatomata in the perianal connective tissue ; the latter are caused by the rupture of a small perianal vein. All external piles are covered by skin.

Mention the Clinical Features of Internal Hæmorrhoids.

In the early stages the symptoms are merely the painless passing of blood during or after defæcation. The diagnosis depends on proctoscopy as the hæmorrhoids cannot be felt.

As the piles become larger they are protruded from the anus with each defæcation, but at first they reduce themselves spontaneously. Bleeding is now more severe and is aggravated by the congestion of the pile by the sphincters when prolapsed. The irritation of the rectum causes some pain and the production of excess mucus. On inspection the piles may be seen when the patient strains and with the proctoscope they are seen as polypoid tumours of considerable size.

If untreated the condition progresses until the pile masses are constantly prolapsed through the lax atonic sphincter and the covering epithelium changes to the squamous type thus minimising the hæmorrhage.

What are the Common Complications ?

(a) Infection of the pile may cause phlebitis and thrombosis with spontaneous cure.

(b) The prolapsed piles may be strangulated by the external sphincter and if the congested mass is not reduced gangrene ulceration and infection will supervene.

What is the Treatment ?

In the early stages palliative treatment is of value, but in the later stages injection or operation will be necessary. In all cases the cause of the condition should be removed or corrected before local treatment is advised.

Constipation is controlled by liquid paraffin, senna and diet, and local cleanliness is insisted on. Ointments or suppositories with gallic acid, hæmamelis, tannic acid, or other soothing and astringent drugs are employed.

Injection therapy.—Injection treatment is advocated for severe internal piles which do not prolapse or which reduce themselves spontaneously. Two methods of injection have been employed—(a) into the pile ; (b) above the pile. The low injection is made with a special syringe and up to M10 of 10 per cent. phenol in glycerin are injected. The high injection is now in more general use, the proctoscope is passed and the upper limit of the pile to be injected is identified. The special guarded needle is inserted into the

submucosa about $\frac{1}{4}$ -inch above the pile and 4 per cent. phenol in almond oil is injected. This balloons the mucosa and the injection is stopped when fine red vessels are seen coursing over the pallid mucosa. After the elapse of a week another injection may be given into a different quadrant of the rectum. No injection must be given in cases of strangulation or ulceration.

Operation is indicated in cases too severe for injection therapy and in recurrences after adequate injection. The primary piles are removed by one of the many operations described.

How would you treat Strangulated Internal Hæmorrhoids?

The patient is treated in bed with the foot of the bed elevated, and hot or cold local applications to relieve the congestion. Pain is relieved by morphine and an attempt is then made to reduce the prolapse with the gloved hand. This may require anæsthesia. When the acute phase is safely over operation is advised.

Describe External Hæmorrhoids.

An external pile consists of a tag of perianal skin containing a small vein and gives no trouble unless rupture of the vein occurs. The blood clots and the thrombosed external hæmorrhoid forms a purplish globular swelling at the anal orifice. If seen in the early stage it should be incised and the clot turned out under local anæsthesia. If untreated it forms a fibrous tag which may cause irritation.

RECTAL ABSCESSSES AND FISTULA-IN-ANO.

Classify Abscesses of the Rectum.

Abscesses of the rectum and anal canal are classified into :—

- | | |
|--------------------|----------------|
| (a) Ischio-rectal. | (c) Submucous. |
| (b) Pelvi-rectal. | (d) Perianal. |

Describe Perianal Abscess.

This is a superficial abscess of the anal margin which may begin from infection of a scratch or as a boil. The symptoms are discomfort and acute pain on defæcation. The swelling is easily diagnosed and is only of importance because of the possibility of rupture into the rectum or ischio-rectal fossa.

The abscess is incised and the skin edge trimmed and a pack of vaseline or flavine inserted. Healing should take place from below.

Describe Submucous Abscess.

A submucous abscess generally follows small abrasions of the rectal mucosa, such foreign bodies as fish bones being specially liable to tear the mucosa. The clinical features are irritation, pain on defæcation, and the abscess can be felt as a fluctuating tender projection of the bowel wall.

The abscess must be incised throughout its extent after dilating the sphincter. A pack is inserted.

Describe Ischio-rectal Abscess.

Abscess in this region generally follows trauma or ulceration of the rectal mucosa. It may result from direct puncture of the bowel or may be secondary to suppuration. In the latter case pus reaches the ischio-rectal fossa by passing between the levator ani and the sphincters. Sometimes the abscess is due to tears of the perianal skin which have become septic. A chronic form of ischio-rectal abscess is caused by tubercle bacilli, the organisms lodging in the anal crypts. Suppuration occurs in the crypts, the resulting pus travelling into the ischio-rectal fossa.

Give the Clinical Features.

- (a) Pyrexia, more or less severe.
- (b) Great pain, increased on defæcation.
- (c) Bladder trouble, such as irritability, strangury, or even retention.
- (d) A tense swelling on the lateral aspect of the anus.
- (e) Fluctuation may be detected in the swelling.

If the abscess be neglected, pus can spread either (a) into the rectum, causing an internal rectal sinus, the opening being near the muco-cutaneous junction ; (b) on to the skin surface, leading to an external rectal sinus ; (c) into the rectum and also on to the skin surface—a fistula-in-ano ; or (d) affects the opposite ischio-rectal fossa—a horse-shoe sinus.

What is the Treatment ?

The abscess must be incised as soon as possible under general anæsthesia. The incision must be adequate, all recesses of the abscess cavity are opened up, and a pack of flavine or vaseline gauze is inserted. Healing must take place from below lest a fistula supervenes.

Describe Pelvi-rectal Abscess.

Pelvi-rectal abscesses occupy the space between the levator ani and the muscular tunic of the rectum and they may result from suppuration in the bladder, prostate, broad ligament, uterus, uterine tubes, or from appendicitis or diverticulitis. The pus may rupture into the rectum, through the levator ani into the ischio-rectal fossa or it may point above the inguinal ligament.

The symptoms are those of the original lesion and the abscess may be felt above the internal sphincter, its upper limit frequently being out of reach.

The abscess may be opened through the ischio-rectal fossa or into the rectum.

Give the Pathology of Fistula-in-Ano.

Fistula-in-ano, either complete or incomplete, arises from a chronic abscess in the region of the rectum and is frequently tuberculous. The complete fistula most commonly follows an ischio-rectal abscess which has burrowed through the rectal mucosa and also opened upon the skin surface.

Incomplete varieties are two in number : (a) *internal rectal sinus* (blind internal fistula), and (b) *external rectal sinus* (blind external fistula).

Several factors prevent a fistula-in-ano from closing spontaneously. These are—(a) want of rest ; (b) infection from the abscess or bowel ; (c) epithelialisation of the fistula ; (d) tortuosity of the narrow track, hence imperfect drainage ; and (e) a more or less constant discharge.

What are the Clinical Features ?

The patient frequently complains of “ piles.” He has pain and discomfort in the perineum, the pain being specially severe during defæcation. A slightly blood-stained discharge, often with a fæcal odour, escapes from the external orifice of the fistula. On examination, the external opening will be found near the anus ; it is commonly surrounded with one or two reddish granulations. Carefully introduce a probe into the orifice, and, with the aid of a rectal speculum, search for the internal or mucous opening. It is usually situated a little more than an inch from the anal margin.

Pruritus may be the only symptom of an internal sinus.

How is it Treated ?

Operative interference is always necessary.

INTERNAL RECTAL SINUS.—(a) *If below the internal sphincter.*—Pass a probe along its track on to the skin surface, *i.e.* convert the sinus into a complete fistula ; then slit it up ; (b) *If through or above the internal sphincter.*—Complete the fistula but do not slit it up.

In each case subsequently pack the external orifice with gauze.

EXTERNAL RECTAL SINUS.—(a) *When superficial to the internal sphincter.*—Convert into a complete fistula ; (b) *When it passes above the internal sphincter.*—Enlarge the external opening, scrape thoroughly and pack with gauze.

COMPLETE FISTULA.—Pass a probe along the fistula from the external orifice ; bend the probe so that the end can be withdrawn through the anus, and divide the tissues between the probe and the surface. Scrape thoroughly, or in long standing cases excise the track and pack with flavine gauze.

In all cases healing must be from below or recurrence will follow.

CATECHISM SERIES

SURGERY

PART IV

FIFTH EDITION

REVISED AND REWRITTEN

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SURGERY

PART IV

STRICTURES AND ULCERS OF THE RECTUM.

Classify Strictures of the Rectum.

Strictures of the rectum may have either a non-malignant or a malignant origin. The former may be—

- (a) Gonorrhœal.
- (b) Tuberculous.
- (c) Dysenteric.
- (d) Syphilitic.
- (e) Traumatic.
- (f) Lympho-granuloma inguinale.

Give the Pathology of Non-malignant Strictures.

Non-malignant stricture is usually within three inches of the anal margin. It may assume any shape, though in the majority of cases tuberculous and dysenteric strictures are irregular, while the syphilitic variety is annular, that is, it involves a narrow ring-like portion. Tubular strictures sometimes occur. Above the stricture, the bowel is laden with fæces, its mucous membrane shows catarrhal changes, and is covered with small ulcers, while the muscular tunic is hypertrophied. Fistulæ often form below the stricture and hæmorrhoids are a common complication. When the stricture occurs high up in the bowel, the muscular coat below is paralysed; gas and fæces collect, leading to “ballooning.”

What are the Clinical Features?

Females are more commonly affected than males, and the young more frequently than the old. Difficulty in passing a

motion combined with a little pain is generally the first sign. Later there are attacks of obstinate constipation alternating with diarrhœa ; at first the diarrhœa is slight, and occurs in the mornings. Tenesmus accompanied by a blood-stained mucous discharge may occur. The stools may become ribbon-shaped ; sometimes they are passed as small balls, like marbles. Ultimately, meteorism arises, often with visible peristalsis. Digital examination is easy, as the anal canal is relaxed. Great caution must be exercised as the bowel may be perforated and peritonitis set up.

Mention the Treatment.

The bowels must be kept open by such aperients as Carlsbad salts. Diminish the amount of solid food taken by the patient. If there is tenesmus, an occasional belladonna suppository is beneficial. Unless marked ulceration is present, the stricture should be gradually dilated with bougies. Large tubular strictures may require external proctotomy. In this operation the rectum and anal canal are divided from a point above the stricture. Pack the wound and allow it to granulate. When healing occurs, a bougie is passed from time to time, in order to prevent the stricture reforming.

Excision of the affected portion of the rectum with end-to-end anastomosis is sometimes necessary, while in old-standing cases complicated with cellulitis and fistulæ, an inguinal colostomy is required.

What are the Sites of Ulcers of the Rectum ?

Ulcers of the rectum are classified in a similar manner to strictures. The usual situations for the non-malignant varieties are :—

- (a) *Traumatic* . Posterior wall of anal canal and rectal ampulla.
- (b) *Dysenteric* . Pelvic colon and upper part of rectum.

- (c) *Tuberculous* Anal crypts, *i.e.* just above the white line of Hilton.
 (d) *Syphilitic* . Lower part of ampulla of rectum.

The dysenteric variety only implicates the mucous membrane, but tuberculous ulcers perforate the remaining coats of the bowel.

Give the Clinical Features.

Rectal ulcers, like strictures, are more commonly met with in women. The main features are :—

- (a) Morning diarrhœa with passage of—
- (b) Thin, muco-purulent “ coffee-ground ” fæces.
- (c) Tenesmus and rectal discomfort.
- (d) Dull, aching pain in the sacral region.
- (e) Colicky pains in the abdomen.
- (f) Symptoms of stricture gradually supervene.

What is the Treatment ?

- (a) Where possible, treat the cause constitutionally.
- (b) Keep the patient in bed, or in a reclining position.
- (c) Regulate the bowels with laxatives.
- (d) Scrape the base of the ulcer, and apply silver nitrate.
- (e) If these measures fail, forcibly stretch the sphincters, and excise the ulcer.
- (f) Colostomy may be necessary.

Mention the Important Features of Injuries to the Rectum.

Apart from injury due to accidents of parturition, unskilled surgery and self-inflicted injuries, trauma is uncommon. It is usually the result of falls on to spiked objects.

The symptoms are pain, bleeding, and shock. A careful examination must be made and the possibility of perforation into the peritoneal cavity, bladder or vagina must be remembered.

TUMOURS.

Classify Rectal Tumours.

| | | | | |
|----------------------|---|-------------------|---|-----------|
| (a) <i>Benign</i> | { | Adenoma | { | Single. |
| | | | | Multiple. |
| | | Fibroma. | | |
| | | Papilloma. | | |
| (b) <i>Malignant</i> | { | Lipoma. | | |
| | | Rectal carcinoma. | | |
| | | Anal epithelioma. | | |
| | { | Sarcoma. | | |

Give their Pathology.

Adenoma is the most common innocent tumour which occurs in the bowel. It arises from the epithelium of the glands of the rectal mucosa. It is soft in consistence, with a colour and appearance like a raspberry. At first the tumour is sessile, then because of the constant rectal straining, a pedicle develops (rectal polypus).

Rectal papilloma occurs as a sessile tumour, red in colour and covered with villous processes; it often resembles a villous papilloma of the bladder.

What are the Clinical Features of Benign Tumours?

The clinical features are :—

- (a) Rectal irritability.
- (b) Tenesmus.
- (c) A discharge of blood-stained mucus.
- (d) Rarely actual pain, unless an anal fissure is also present.

The tumour is examined by palpation and by proctoscopy.

What is the Treatment?

Simple tumours are removed after stretching the sphincter by tying off the pedicle in the case of polypi and by excision

of the affected area of mucosa in papilloma. Multiple tumours may justify excision of the rectum as they are in many cases pre-cancerous.

Describe Rectal Carcinoma.

The tumour is of the columnar-celled or malignant adenoma variety, and generally occurs after middle life. At first it is covered with normal mucous membrane, but subsequently this is destroyed by ulceration, and the cancer presents a fungating mass projecting into the interior of the rectum. Sometimes the tumour extends round the circumference of the bowel, infiltrating all the coats and forming adhesions to neighbouring viscera, *e.g.* to the bladder, prostate, vesiculæ seminales, uterus and vagina. The ano-rectal lymph glands are affected, then the sacral and meso-colic, ultimately reaching the left lumbar chain of glands. Secondary growths are most commonly found in the liver.

Give the Clinical Features.

It is highly important to remember that at first the disease is very insidious. Perhaps a complaint of flatulence and a little uneasiness about the rectum and anus. Pain is only slight unless the anal canal, sacral nerves, or bladder are involved. Pain during defæcation, blood in the stools, constipation alternately with diarrhœa, and a slimy, mucous, blood-stained discharge are later features. Pipe-stem like stools are often found, and the rectum often feels full after defæcation.

On digital examination, a hard nodular growth of irregular outline will be felt. If the tumour is out of reach of the finger, the bowel below it is ballooned. The sigmoidoscope reveals the tumour.

What is the Treatment?

The tumour is inoperable if the rectum is attached to the surrounding viscera, if the lumbar glands or liver are involved.

At the first operation of inguinal colostomy operability is decided.

Tumours within four inches of the anus are treated by perineal resection and cases above that level by the abdomino-perineal operation.

Inoperable cases are considerably relieved by colostomy; radium or X-ray therapy may delay the end.

Describe Sarcoma of the Rectum.

A rare tumour springing from the submucous tissue of the anal canal, and extending upwards to the rectal ampulla. Clinically it closely resembles carcinoma. The glands—inguinal, sacral, and lumbar are early affected.

The treatment is similar to that for rectal carcinoma, but the disease is even more lethal.

Describe Epithelioma of the Anus.

Epithelioma arises in the vicinity of the white line of Hilton as a warty thickening of the epithelium, which is covered with dry crusts of mucus and debris. The tumour grows slowly and affects the inguinal and subinguinal glands. Agonising pain is complained of; hæmorrhage is scanty but offensive. The treatment consists in excising the anal canal freely, and subsequently dissecting away the glands in the inguinal region.

GENITO-URINARY SYSTEM.

THE KIDNEY.

Describe the Examination of a case complaining of Urinary Symptoms.

(a) Take a careful *history* inquiring into :—

(1) *Pain*—site and radiation ; persistent or spasmodic.

(2) *Urine*—*Amount passed*, increase is polyuria.

Frequency (this does not mean polyuria) nocturnal, diurnal or both.

Dysuria, i.e. painful micturition. Is pain during or at end of micturition?

Is the *stream* forcible or diminished in size and form.

Hæmaturia. Is the blood mixed with the urine, are clots passed or does it come at the end of micturition?

Examination, chemical and microscopic examination.

Catheter specimen, for culture in cases of urinary infection.

(b) *Palpation*.—It is doubtful if a normal kidney can be felt through the abdominal wall. The patient should be supine, with the head and shoulders raised and the hips flexed.

(c) *Percussion*.—The relation of the large bowel to the kidney swelling (if present) should be determined. Remember that the ascending colon lies to the medial side of a right kidney swelling, and the descending colon in front or on the outer side of a left kidney swelling.

(d) *Straight X-ray*.—This may show an opaque calculus. Remember that a shadow is not proved to be in the kidney without artero-posterior and lateral views and even then further investigations are required.

(e) *Excretion or intravenous pyclography*.—Uroselectan, pyelectan or perabrodil is injected intravenously and the excretion of the opaque halogen compounds gives an outline of the renal pelvis, ureters and bladder, i.e. a pyelogram and a cystogram. Not only does this reveal the outline of the kidney but it gives an indication of the renal function for a diseased kidney may show delayed excretion, a poor excretion shown by the faintness of the shadow or complete failure of visualisation. Failure to cast a shadow does not mean absence of the kidney and further investigation is required.

(f) *Cystoscopy*.—The cystoscope may be passed under local anæsthesia. A sterile specimen of urine is obtained for

culture and examination. The bladder is filled and its capacity noted. The bladder wall is examined and the ureteric orifices inspected. The normal ureter discharges urine in jets by peristalsis. If indicated the ureters are catheterised under vision and the distance the catheter has passed is noted. Specimens are now collected from both kidneys.

X-rays are taken :—

- (a) to show the course of the ureters as revealed by the opaque ureteric catheters and the presence of any other opacity.
- (b) After the injection of sodium idodide 12% into each kidney. This is known as retrograde pyelography.

(g) *Test of Renal Efficiency.*—It may be necessary to estimate the function of both kidneys before operations on the prostrate or of the “normal” kidney before nephrectomy. The total efficiency can be gauged by the estimation of the blood urea but to arrive at the function of one kidney its urine must be collected by ureteric catheter and the concentration of urea estimated. If doubt remains this should be done after a urea concentration test.

Methylene blue and indigo-carmin are useful in helping to find the ureteric orifice in difficult cases but are not reliable tests of renal efficiency.

What are the Congenital Malformations of the Kidneys and Ureters?

The congenital malformations of the kidneys and ureters comprise :—

- (a) Fusion of the lower poles of the kidneys : a “horse-shoe kidney” resulting. The ureters descend in front of the bar connecting the two halves of the conjoined kidney.
- (b) Absence of one kidney.
- (c) Imperfect development of one kidney.
- (d) Congenital polycystic disease.
- (e) Congenital misplacement and abnormal renal vessels.
- (f) Bifid pelvis and double ureters.

Describe Polycystic Disease of the Kidney.

Polycystic kidneys are encountered clinically in infants and also in adults. The condition is usually bilateral and commoner in females than in males. The disease is a congenital malformation, due to a failure of union of the renal excretory canals with the convoluted tubules. A somewhat similar affection may be present in the liver, pancreas, or spleen. The kidneys are enlarged, reniform in outline, and full of thin-walled cysts. The cysts contain a yellowish gelatinous substance composed of epithelial cells, tube casts, blood corpuscles, and albumin. Those portions of the renal parenchyma which are not cystic show the sclerotic changes of chronic Bright's disease.

The main clinical features are—(i) a slow enlargement of the kidneys ; (ii) a dull aching pain in the loins when the disease is advanced : (iii) polyuria, the urine having a low specific gravity with a diminished amount of urea and urinary salts (tube casts are rare) ; (iv) later, signs of renal failure ; (v) hæmaturia.

In young children the changes of renal rickets may develop (p. 53). Diagnosis depends on the pyelogram which shows a long narrowed pelvis with the normal calyces connected to it by narrow elongated channels.

There is no treatment.

Describe Renal Trauma.

The kidneys are more frequently injured in males than in females. A slight degree of violence results in *contusion* ; severe violence leads to *laceration*. When the kidney is lacerated, the capsule is likewise torn ; thus blood is extravasated into the perirenal fat, and into the loose connective tissues behind the peritoneum. Lacerations are more commonly found on the anterior surface and near the inferior pole. Urine escapes along with blood when the pelvis is damaged, and unless drained, such a collection will become septic. Rupture of the kidney is especially dangerous in children, as owing to the absence of perirenal fat the peritoneum is frequently torn.

What are the Clinical features ?

Usually after the injury the patient collapses and displays all the signs of profound shock. After a varying interval reaction ensues ; this is marked by shooting pains along the line of the ureter, pain in the kidney region, and vomiting. If laceration has occurred, a swelling forms in the loin. Additional important features are :—

- (a) Hæmaturia (*absent* if the ureter is avulsed, or if it is blocked by a clot).
- (b) Rigidity of the abdominal parietes on the side of the injury.
- (c) Meteorism.

When the peritoneum is torn there is great shock, increasing dulness in the lower parts of the abdomen, and septic peritonitis commencing about the third day after the injury.

Sepsis may occur in the extravasated fluid. The chief features are :—

- (a) Constitutional disturbances, rigors, sweating, etc.
- (b) An increase in size of the swelling in the loin.
- (c) Pyuria.
- (d) Diminution in the total quantity of urine passed.

Give the Treatment.

- (a) *In slight cases.*—Keep the patient in bed under observation. Each specimen of urine should be compared with the previous one to establish whether the bleeding is lessening. Allow up when all bleeding has ceased for ten days.
- (b) *In more severe cases.*—In the presence of a definite swelling or increasing hæmaturia the kidney must be explored and nephrectomy or suture carried out.
I.V.P.

What is Hydronephrosis ?

Hydronephrosis is a condition in which the pelvis and calyces of one or both kidneys are permanently dilated. It is due to incomplete obstruction to the outflow of urine

which may be gradually cut off or only retarded intermittently. If the flow of urine is completely or suddenly obstructed suppression of urine will follow. Hydronephrosis is due to a variety of causes and will be bilateral if the obstruction lies within or distal to the bladder.

The causes are :—

- | | | |
|---------------------|---|--|
| (a) <i>Renal</i> | { | Stricture or valve of pelvi-ureteric junction. Nephroptosis. Sympathetico-renal tonus. |
| (b) <i>Ureteric</i> | { | Impacted renal calculus. Aberrant renal artery. Pressure from without. Injuries leading to stricture. |
| (c) <i>Vesical</i> | { | Calculi. Tumours. |
| (d) <i>Urethral</i> | { | Valve. Stricture. Phimosis. Prostatic hypertrophy or tumour. |

Give the Pathological Changes.

- (a) The pelvis and calyces are distended, and their walls atrophied.
- (b) The secreting tissue likewise becomes atrophied.
- (c) The ureter is fixed to the posterior surface of the pelvis.
- (d) The inferior part of the pelvis often sags below the origin of the ureter.
- (e) In advanced cases, the hydronephrotic fluid resembles blood serum.

The dilated pelvis forms a cystic swelling which has to be distinguished from an ovarian cyst, hydated cysts of the liver, a distended gall-bladder, or a renal tumour.

What are the Clinical Features ?

- (a) Dull aching kidney pain.
- (b) Sterile urine.

- (c) Renal swelling. In early cases this is not marked or absent.
- (d) Intermittent polyuria—dilute urine.
- (c) Attacks of renal colic may occur.
- (f) Pyelography establishes the diagnosis. It shows in the early stages loss of cupping of the calyce followed by dilatation of the calyces and pelvis.

What is the Treatment?

If diagnosed in the early stages treat the cause if it can be found. In the late stage when there is marked atrophy of the secreting tissue remove the kidney. In cases of sympathetico-renal tonus perform sympathectomy by stripping the renal vessels. In other cases pyelo-ureterostomy and other plastic operations are preferable to nephrectomy.

What is the Pathology of Nephroptosis?

In nephroptosis, or acquired displacement of the kidney the kidney either slips about within the perirenal fascia—*movable kidney*, or passes forwards towards the front of the body—*floating kidney*. The suprarenal body is not displaced. It is important to remember that a normal kidney accompanies the movements of the diaphragm; the respiratory excursions varying from 1 to $1\frac{1}{2}$ inches.

As the kidney moves about, the upper pole is tilted forwards, thus kinking the ureter and renal vessels. In course of time, a condition known as intermittent hydronephrosis develops, the kidney swelling when displaced, and returning to its normal size when the kink is undone.

Give its Etiology.

The condition is most common in females, and is generally found on the right side. The predisposing causes are said to be (a) an imperfectly formed, and shallow kidney bed, and (b) a diminished amount of perirenal fat.

In certain cases the nephroptosis is part of a general prolapse of the abdominal viscera (*Glenard's disease*).

What are the Clinical Features ?

Four main types are to be distinguished.

1st type—no symptoms.

2nd „ symptoms of neurasthenia.

3rd „ gastro-intestinal disturbances.

4th „ symptoms simulating renal calculi.

In the last group of cases attacks of renal colic (Dietl's crises) occur, *i.e.* shivering, collapse, rapid feeble pulse, often vomiting, and agonising pain shooting down the ureter. They are due either to torsion of the renal pedicle, or to dragging upon the bowel. The pain due to a movable kidney is always worse after severe exercise, and usually disappears when the patient lies down.

Describe the Treatment.

Only operate (nephropexy) in the presence of hydronephrosis. A belt or other support draws attention to the condition and should be avoided. Try to increase the patient's weight and treat on psychological grounds.

What are the Pyogenic Diseases of the Kidney ?

The pyogenic diseases of the kidney are pyelitis, pyelonephritis, and pyonephrosis. *Pyelitis* is a septic inflammation of the pelvis of the kidney. *Pyelo-nephritis* is a septic inflammation of the pelvis and the renal parenchyma, while *pyonephrosis* is a pyelo-nephritis, together with abscesses in the calyces. It is exceedingly doubtful if pyelitis can occur without some involvement of the kidney substance.

What is the Surgical Importance of Pyelitis ?

Acute pyelitis is essentially a medical problem and its adequate treatment by fluids, sulphanilamides, ketogenic diet or mandelic acid leads to recovery. Certain cases, however, are resistant or become chronic and here a complete urological investigation must be carried out to find which kidney is at fault and whether there is any other

causal factor. In unilateral cases of long standing which have failed to respond to treatment nephrectomy is justifiable.

Describe Pyelo-nephritis.

Surgically, pyelo-nephritis is generally secondary to septic cystitis, the organisms reaching the kidney *via* the ureter or the peri-ureteral lymphatics (ascending infection), or by the blood stream (hæmatogenous infection), from chronic constipation, boils, tonsillar abscesses, etc. On section of the diseased kidney, the following points will be noticed—(a) marked congestion and catarrh of the pelvis, (b) numerous small abscesses in the glomeruli, and (c) radiating yellow streaks through the medulla showing the presence of pus in the uriniferous tubules. In the majority of cases both kidneys are affected.

The chief signs and symptoms are :—

- (a) One or more rigors.
- (b) Quick pulse and respiration, marked constipation, headache, nausea, and dry, furred tongue.
- (c) The urine is diminished in quantity, ammoniacal in odour and contains pus, blood, and albumin.
- (d) Tenderness on palpation of the kidney region.

Surgical treatment is a last resource and nephrostomy may be required.

Describe Pyonephrosis.

Pyonephrosis usually follows either (a) septic cystitis ; (b) renal calculus ; or (c) hydronephrosis. In the former case the condition is bilateral, in the latter case it is unilateral. Some obstruction to the outflow of urine from the pelvis of the kidney is constantly present. Although the abscess cavities at first communicate with each other and with the pelvis, at a later stage they are shut off, and form independent collections of pus. Endarteritis obliterans of the renal arteries is a common sequel.

The clinical signs are those of hydronephrosis, plus constitutional disturbances, the latter being due to septic

absorption and diminished urea excretion. Usually there is a large quantity of pus in the urine.

The treatment is to perform nephrotomy and remove calculi if present. If the kidney does not recover nephrectomy should be carried out.

Describe Perinephric Abscess.

This may arise as the complication of some neighbouring inflammatory process or may be the primary condition when it arises from renal carbuncle or apparently from no definite cause although there may be staphylococcal skin lesions.

The features are :—

- (a) Septic fever.
- (b) Pain in the back.
- (c) May be pus in urine.
- (d) Tenderness in loin.
- (e) Swelling in loin bulging posteriorly.
- (f) Pain on extending the hip.

The diagnosis may be difficult. The treatment is to drain the abscess.

Give the Pathology of Renal Tuberculosis.

Genito-urinary tuberculosis is secondary to disease elsewhere and the organisms reach the kidney by the blood stream. Tuberculosis of the genital organs (Fallopian tubes, prostate, or epididymis) is often associated with renal tubercle. The disease is said to be more common in females than in males. At first renal tuberculosis is nearly always unilateral.

The bacilli are arrested in the glomeruli; they subsequently involve the renal papillæ and the mucous membrane of the calyces. Typical grey tubercles are formed; these caseate, thus becoming yellow tubercles; the latter break down, leaving shaggy ulcers. The coalescence of these ulcers results in the production of large irregular cavities filled with caseous debris.

Both the renal and vesical extremities of the ureter are

involved. The ureter is adherent to the kidney, and owing to the extension of the disease to the perirenal fat and perinephric fascia, the kidney becomes fixed to the peritoneum and neighbouring viscera. Frequently the outer surface of the kidney is covered with projections corresponding to the abscess cavities.

What are the Clinical Features ?

At first the disease may suggest either (a) renal calculus, (b) malignant tumour of the kidney, or (c) cystitis. Early signs are :—

- (a) Increased frequency of micturition.
- (b) Pyuria and acid urine.
- (c) Injection around the vesical orifice of the corresponding kidney. At a subsequent period retraction and often ulceration occur.
- (d) Tubercle bacilli in the urine.
- (e) Attacks of renal colic when tubercular debris passes down the ureter.

Later, the signs are diagnostic, for the patient emaciates, suffers from hectic fever, and has an enlarged kidney with irregular nodules. Unless treated, the patient dies from toxæmia, exhaustion, or uræmia.

The urine has the following features :—

- (a) Acid in reaction.
- (c) Turbid in appearance, containing pus, tubercle bacilli often, and sometimes blood.

Always suspect tubercle when pus is present in a sterile urine. The diagnosis may depend on guinea pig inoculation in doubtful cases.

What is the Treatment ?

If the disease is unilateral and there is no active tubercle in other organs and the function of the other kidney is normal the kidney and as much of the ureter as possible should be removed. Otherwise full sanatorium treatment is required.

Give the Main Surgical Causes of Hæmaturia.

- | | | |
|---|---|--|
| A. Upper Urinary Tract —KIDNEY AND URETER . . . | { | (a) Trauma. (b) Calculi. (c) Tuberculosis. (d) Neoplasms, especially hyper- nephroma. (e) Billharzia. |
| B. Middle Urinary Tract —BLADDER AND PROSTATE . . . | { | (a) Trauma. (b) Calculi. (c) Tuberculosis. (d) Carcinoma. (e) Papillomata. (f) Acute cystitis or prostatitis. (g) Enlarged prostate. |
| C. Lower Urinary Tract —URETHRA. . . | { | (a) Trauma. (b) Calculi. (c) Rupture of corpus spongi- osum. |

How would you Diagnose the Site of the Hæmorrhage ?

- | | | |
|---|---|---|
| A. From UPPER Urinary Tract | { | It is intimately mixed with the urine (smoky urine). Blood casts may be present. |
| B. From MIDDLE Urin- ary Tract | { | The blood usually appears after the urine, or in the last por- tion of the urine. It is often coagulated from having col- lected for some time in the bladder. |
| C. From LOWER Urinary Tract | { | The blood comes before, or with the first portion of urine. It may flow during the intervals between micturition. |

Always bear in mind that hæmoglobin may be present or that the colour may be due to pigment, *e.g.* from eating beetroot. Microscopic evidence of red cells is required for the diagnosis of hæmaturia.

Describe Essential Renal Hæmaturia.

Essential renal hæmaturia is a condition characterised by attacks of hæmorrhage from one kidney. The etiology is very obscure. It may follow renal infection. In many cases patches of chronic nephritis are found in the affected kidney ; occasionally a congested renal papilla is the source of the bleeding. The clinical features are :—

- (a) Capricious attacks of hæmaturia, uninfluenced by movement and not benefited by rest.
- (b) During the attacks the urine is burgundy-coloured, and usually free from clots.
- (c) Bacteria are absent from the urine.
- (d) On palpation, the affected kidney is of normal size, and is not tender.
- (e) The hæmorrhage is unilateral.
- (f) All other investigations are negative.

Severe cases may require nephrotomy and if no cause be found nephrectomy may be justifiable.

Describe Renal Calculi.

The etiology of renal calculi is still obscure. Some factor must cause the precipitation of crystals which are normally present in the urine in supersaturated solution. The mere presence of crystals will not cause a calculus to form and it is possible that some abnormal substance forms a nucleus for the stone formation. Infection is not a cause of stone formation but in most cases follows the calculus. Concentration of the urine and vitamin deficiency have been advanced as an explanation of the frequency of stone in the tropics.

Once a stone has begun to form its composition depends on the acidity or alkalinity of the urine and mixed stones will result when the urinary reaction changes during their formation.

In acid urine (a) uric acid, (b) urate, (c) oxalate stones are common. Cystin stones are due to a metabolic factor and are a familial disease, they are found in acid urine. In alkaline urine phosphate stones are most frequent.

Renal calculi are most common in adult males and frequently occur in both kidneys.

Contrast the Common Varieties of Stone.

Uric acid stones may be multiple when they are faceted, the colour is brownish yellow, the surface resembles morocco leather and they are hard in consistence.

A calcium oxalate stone is extremely hard, of a dirty brown colour, with a spiked surface and on section shows zigzag lamination. It casts a dense shadow on X-ray.

Phosphate stones are soft and friable and composed of triple phosphates. They are white in colour, light in weight and usually smooth on the surface.

Cystin stones are rare. They are yellowish or greenish, on the surface are smooth and on section resemble beeswax.

What are the Clinical Features ?

Symptoms and signs depend on the mobility of the stone. If the stone lies in the cortex or is wedged in a calyx there may be no symptoms (latent or silent stone) and it is only discovered accidentally.

A stone lying in the renal pelvis gives rise to :—

(a) Pain ; worse after exercise, and relieved by lying down.

(b) Urinary changes :—

(1) Hæmaturia. No leucocytes unless there is infection.

(2) Albuminuria.

(3) Crystals.

(4) Urine reaction helps to indicate type of stone.

(c) Tenderness in the posterior kidney angle.

(d) On X-ray examination a shadow may be cast by the stone but some calculi are not radiologically opaque. Oxalate stones give the densest shadow. A lateral view must also be taken and shadows due to (a) ossified cartilages ; (b) calcified mesenteric glands ; (c) gall stones ; (d) enteroliths should not be forgotten.

Pyelography confirms the site of the shadow and reveals a non-opaque calculus as a filling defect.

Renal Colic occurs when a calculus leaves the pelvis and passes into the ureter. The pain is due to the spasmodic contraction of the unstriated muscle which may be sufficient to force the stone into the bladder after one or more attacks or impaction may occur. The attack comes on suddenly, is paroxysmal in character, while the pain shoots along the genito-femoral nerve to the groin or testicle. Other features are nausea, vomiting, collapse, and strangury. X-ray shows the site of the stone and its progress must be carefully watched. If impaction occurs and the obstruction is not complete hydronephrosis will develop. In other cases impaction may be followed by anuria.

What is the Treatment ?

In unilateral cases the stone should be removed. In bilateral cases after a careful investigation the stone should be removed from the kidney which is found to have the best function and after an interval the other kidney may be dealt with.

Renal colic is treated by the hypodermic injection of morphine and atropine and the progress of the stone watched by repeated X-rays. If progress is being made the stone may be allowed to pass but if it is held up it should be removed by operation. The passage of a stone held up at the lower end of the ureter may be assisted by ureteral dilatation.

What is Anuria ?

Anuria or an absence of urinary excretion may be due to several causes of which the chief are (a) hysteria ; (b) obstruction, as in calculus anuria ; (c) circulatory changes with a lowered blood pressure ; (d) reflex, from interference with some part of the urinary tract ; (e) destruction of the renal tissue ; (f) sudden relief of urinary obstruction ; (g) following severe crushing injuries of the limbs ; and (h) sulphanilamide therapy.

Describe Calculus Anuria.

Calculus anuria generally occurs from the sudden blockage of a ureter by stone, the opposite kidney being either absent or previously diseased. The calculus is usually single and of small size.

Clinical features :—

- (a) Kidney of affected side is swollen and tender.
- (b) Rigidity of the abdominal muscles on the same side.
- (c) Often tenderness along the line of the ureter.
- (d) Attacks of renal colic with strangury.
- (e) The urine is diminished in quantity or total anuria supervenes.
- (f) Sometimes there are intermittent attacks of polyuria for a few days, then signs of renal failure appear. These are nausea, want of appetite, headache, constipation, drowsiness, contracted pupils, muttering delirium, often subnormal temperature muscular twitchings, slow pulse, attacks of dyspnœa, and ultimately coma.

Give its Treatment.

The diagnosis must be made and treatment carried out at the earliest possible moment. The difficulty is to localise the stone in cases of non-opaque calculus. If the stone is localised it should be removed, but if its site cannot be established nephrostomy should be performed.

Describe Renal Tumours.

The commonest renal tumours are the :—(1) “mixed” tumours of infants ; (2) sarcoma ; (3) carcinomata ; (4) hypernephroma ; (5) angioma ; (6) papilloma and carcinoma of the pelvis.

Renal tumours have the following characteristics :—

- (a) They grow forwards.
- (b) They are reniform in outline.
- (c) The tumour (unless anchored by adhesions) moves with respiration.

- (d) With the patient in the supine position, the tumour falls away from the costal margin.
- (e) The relation to the colon is very important (*see page 227*).
- (f) In malignant growths metastasis is late ; it most commonly occurs by the medium of the blood-vessels, rarely by the lymphatics.
- (g) The symptoms are usually dragging pain and hæmaturia.

In malignant disease, the operation of nephrectomy is indicated, the kidney being removed by the lumbar or trans-peritoneal route.

Give the Features of " Mixed " Tumours.

These tumours originate in the vicinity of the renal sinus, and contain both epithelial and connective-tissue structures ; they are adeno-sarcomatous in nature. The growth invades the kidney substance. The pelvis and calyces of the ureter are incompletely developed. Extension into the renal veins, and ultimately the inferior vena cava, is common, while lymphatic metastasis is a late feature.

Although the tumour generally leads to great enlargement of the affected organ, pain is infrequent, and when present is of a colicky character, owing to the growth displacing or pressing upon the colon. Hæmaturia is absent.

The prognosis is bad.

Describe Hypernephroma.

A hypernephroma is a malignant tumour occurring in the renal cortex. Its secondary deposits are often found in bones, and they closely mimic the structure of the primary growth. The commonest age for hypernephroma is between fifty and sixty. Pathologists are not yet agreed regarding the origin of this tumour. The chief theories are :—(a) it is developed from a suprarenal " rest " ; (b) it is a carcinoma derived from the renal epithelium ; and (c) it originates from the Wolffian body. A hypernephroma affects the right kidney more frequently than the left, is commoner in males than in females, and is the most frequent of new

growths in the kidney. It is rarely bilateral. The tumour is yellowish red in colour, and has a capsule of firm fibrous tissue. It is very vascular, and microscopically somewhat resembles the zona fasciculata of the supra-renal body.

In addition to the clinical features already mentioned attacks of hæmaturia occur. The hæmaturia has certain characteristics :—(a) spontaneous ; (b) capricious ; (c) independent of rest or exertion ; (d) often copious ; and (e) contains clots resembling maggots (Israel). The passage of clots leads to renal colic.

BLADDER.

What methods are employed in Examining the Bladder ?

The bladder is examined by :—

- (a) Suprapubic palpation and inspection. The distended bladder may be seen and felt but if empty it cannot be palpated.
- (b) Rectal or vaginal palpation enables the base of the bladder to be felt.
- (c) Catheterisation. This enables the capacity of the bladder to be found and also the amount of residual urine to be measured. It is necessary also for obtaining a specimen for culture.
- (d) Cystoscopic examination.
- (e) X-ray will reveal a calculus and after the injection of sodium iodide a cystogram may show a diverticulum or filling defect. A cystogram may also be obtained following excretion urography.

Instrumental examinations must be carried out gently under full aseptic precautions.

Describe Ectopia Vesicæ.

Ectopia vesicæ is also known as extroversion of the bladder. The condition is commoner in males than in

females. It is a congenital malformation in which the lower part of the anterior abdominal wall, the inferior lateral wall of the bladder, and the roof of the urethra (epispadias) are absent. Other changes noticed are (a) the absence of the symphysis pubis ; (b) the rotation of the limbs outwards at the sacro-iliac joints ; and (c) a rudimentary penis. The testes fail to descend. The posterior wall of the bladder, with the openings of the ureters forms a red prominence below the umbilicus.

Ectopia may be due to a rupture of the fore-part of the cloacal membrane.

The treatment is transplantation of the ureters into the colon followed by the closure of the abdominal wall at a later date.

Describe Rupture of the Bladder.

There are two varieties of rupture of the bladder :— (a) intraperitoneal, and (b) extra-peritoneal. In the former the bladder is full at the time of injury, and the violence is applied to the lower part of the abdominal wall. The tear is longitudinal in direction, and implicates the peritoneal more than the mucous coat. It occurs on the posterior surface, near its summit. Urine, usually blood-stained, passes into the recto-vesical pouch, and unless operated upon promptly, the patient rapidly develops septic peritonitis.

Extra-peritoneal rupture occasionally occurs on the infero-lateral wall, close to the apex, under similar conditions to that of the intra-peritoneal variety. The urine collects in the Space of Retzius, and then ascends towards the umbilicus. Most commonly, however, extra-peritoneal rupture is found on the infero-lateral wall in the vicinity of the neck, and is a sequel to fracture of the pelvis, the upper fragment of the ascending ramus of the os pubis piercing the bladder. Urine accumulates between the bladder and the rectum, and often ascends beneath the anterior abdominal wall. In the latter case note a bulging of the hypogastrium, the upper edge of the swelling being convex ; on percussion dulness is elicited.

Mention the Clinical Features.

The clinical features are :—

- (a) Sudden and violent pain in the pelvis or hypogastrium.
- (b) Intense desire to micturate, but no urine passes.
- (c) A *rigid* catheter easily enters the bladder, and the latter is found to be contracted.
- (d) Only a little urine is drawn off by the catheter ; the urine is often blood-stained.
- (e) Signs of collapse.
- (f) Dulness and bulging of hypogastrium in extra-peritoneal ruptures ; presence of fluid in the recto-vesical pouch (on rectal examination) in intraperitoneal rupture.
- (g) A rapid pulse, persistent hiccough, and abdominal distention indicate septic peritonitis.

Give the Treatment.

In intra-peritoneal rupture the bladder is exposed by a sub-umbilical mid line incision, the tear is sutured and cystostomy performed. Drainage of the recto-vesical pouch may be required.

In extra-peritoneal cases the peritoneum is not opened. The bladder is entered and the tear closed from within ; suprapubic drainage is again established and the Space of Retzius drained.

What are the Causes of Cystitis ?

The predisposing causes of cystitis are :—(a) an obstruction to the outflow of urine ; (b) congestion of the mucosa. The exciting factor is a bacterial infection which may originate in the kidney (descending infection) or reach the bladder from below, *e.g.* from instrumental interference, urethritis or vulvo-vaginitis (ascending infection). The common organisms are the bacillus coli, staphylococci, streptococci, B. tuberculosis and the gonococcus.

Cystitis may be acute or chronic.

Describe Acute Cystitis.

A varying degree of suprapubic and perineal pain is complained of. Gonorrhœal cystitis is particularly painful, while the cystitis resulting from spinal injuries is painless. A certain amount of fever with the resulting constitutional disturbance is constantly present. Frequent and painful micturition causes the patient great distress. Urine is often passed a drop at a time, in a spasmodic manner. The urine is characteristic, being turbid and containing fibrin, pus-cells, and organisms. It is often ammoniacal. In gangrenous cystitis it is chocolate-coloured (altered blood), and has a very offensive odour.

Cystoscopic examination is not indicated during the acute stage.

Give the Treatment.

Bed, abundant fluids, urinary antiseptics such as sulphanilamide depending on the causal organism. Later mandelic acid may be used. If the case does not clear up completely a full investigation to discover the cause is necessary. In the early stages sleep is essential and morphine may be given. In very severe cases cystostomy may be justifiable.

Describe Chronic Cystitis.

Pyuria is a constant sign, being found at all times of the day, and when tested by the "two-glass" method the pus is more abundant in the second portion of urine passed. The patient also suffers from frequent and painful micturition, because the infection reaches the muscle coat with the development of fibrosis and a contracted bladder. Chronic cystitis is a dangerous condition, as infection may spread to the kidney.

The treatment is :—

- (a) Remove the cause.
- (b) Urinary antiseptics, *e.g.* sulphanilamide, mandelic acid.
- (c) Lavage with dilute silver nitrate.

Give the Main Features of Vesical Tuberculosis.

The disease is secondary to that of some other section of the genito-urinary tract, especially the epididymis and the kidney. It is most commonly found in adolescents. The leading signs are :—

- (a) Pyuria, containing tubercle bacilli : they are often exceedingly difficult to detect.
- (b) Hæmorrhage.
- (c) Frequent and painful micturition, the pain being referred to the end of the penis on the conclusion of the act. This symptom is especially distressing during the night.
- (d) Cystoscopy in the early stage may show congestion round one ureteric orifice, later, small tubercles along the line of the ureter and in late cases the “ golf hole ” ureter.

The treatment is to remove the primary lesion if at all possible as the bladder condition usually heals without further surgical treatment.

Describe Vesical Calculi.

Oxalate or urate stones occur in acid urine, phosphatic calculi in alkaline urine. Often a stone consists of alternate strata of uric acid, calcium oxalate, and phosphates—an alternating calculus.

Bladder stones are usually discoid in shape, and when multiple, present facets. Hour-glass stones stick partly in the bladder and partly in the prostatic urethra. Although vesical calculi may form at any age, they are most common in the old and in young boys.

The cardinal symptoms of a vesical calculus are :—

- (a) Hæmaturia.
- (b) Frequency of micturition.
- (c) Pain, worse after micturition, owing to the sensitive mucous membrane coming in contact with the stone.
- (d) Sudden stoppage of the flow of urine during micturition.

In advanced cases the urine is ammoniacal and contains muco-pus. Remember that the first three symptoms in the list are increased after exercise.

In order to determine the size and position of the stone the bladder is examined by X-rays and cystoscopy.

What is the Treatment ?

The operation of choice is known as litholapaxy, *i.e.* crushing the stone with a lithotrite. The instrument is introduced into the bladder by way of the urethra, the stone is split into minute fragments, and the latter are removed by means of an evacuator. One great advantage of this method of treatment is that the patient can get about again within a few days of the operation. When litholapaxy cannot be carried out, suprapubic lithotomy should be performed.

Suprapubic lithotomy is indicated (a) when an enlarged prostate is present ; (b) when the stone is encysted ; (c) when there is an organic stricture of the urethra ; and (d) infection is present.

Describe Tumours of the Bladder.

The common tumours of the bladder are (a) papillomata, and (b) squamous-celled carcinoma. Other varieties of tumour are rare. Vesical tumours are common in workers amongst aniline dyes. Neglected cases of bilharzial infection often develop these neoplasms.

Papillomata arise from the mucous membrane, usually in the region of the trigone. They may either assume a soft, villous form, resembling sea-weed, or a hard warty, sessile appearance. The warty variety is very apt to become malignant. Papillomata generally occur in young males. They are painless, but give rise to profuse hæmaturia. This at first is intermittent, but later practically continuous ; the hæmorrhage is most marked towards the end of micturition. The blood is bright scarlet in colour. Sometimes fragments of the tumour are detached and passed in the urine. In early cases, the cystoscope will materially aid the diagnosis ; in advanced cases, it is impossible to illuminate the bladder.

Treatment is by diathermy through an operating cystoscope. In extensive cases suprapubic cystotomy may be tried but in removing the tumours even with diathermy their liability to metastasise by direct implantation should be remembered.

Cancer of the Bladder.—Cancer of the bladder usually originates in the mucosa of the internal trigone. It is most commonly found in individuals over forty years of age. The leading signs are :—

- (a) Frequent attacks of hæmaturia ; the blood is altered in character.
- (b) Agonising spasms on micturition.
- (c) Pyuria. Cystitis is often the earliest feature in the disease.
- (d) Cachexia.

Treatment may be by fulguration in small tumours or by partial or total cystectomy in larger ones after transplanting the ureters. In cases with severe pain pre-sacral neurectomy may be justifiable.

PROSTATE.

Describe Acute Prostatitis.

Acute inflammation of the prostate results from (a) gonorrhœa, usually towards the end of the third week ; (b) urethral stricture ; (c) trauma of the posterior urethra ; (d) cystitis ; and (e) impacted calculus.

Clinical Features.—Frequent micturition, with pain at the end of the act. Pain during defæcation, and a constant throbbing sensation in the perineum. Constitutional disturbance may be severe. Sometimes blood is passed in the urine.

On rectal examination, the prostate is found hot, tender, and swollen.

If an abscess forms, fluctuation may be detected *per rectum*, and on pressing against the prostate, pus escapes into the urethra.

Give its Treatment.

Place the patient in bed, and raise the foot of the bed in order to diminish the pelvic congestion. Apply hot fomentations to the perineum and give hot enemata. If retention of urine occurs, place the patient in a hot bath, or do suprapubic aspiration. If possible, avoid passing a catheter. When an abscess forms, it generally discharges spontaneously into the urethra.

Appropriate chemotherapy is employed.

Describe Chronic Prostatitis.

Chronic inflammation of the prostate is generally found between the ages of twenty and forty. The usual causes are (a) as a sequel to acute prostatitis; (b) following gonorrhœa, or cystitis or urethral stricture; and (c) sexual excess or masturbation.

Clinical Features.—The symptoms may be of a trivial nature, and in early cases nothing abnormal can be detected on rectal examination. When the disease is well-established the features are :—

- (a) Increased frequency of micturition, most commonly diurnal.
- (b) Uneasiness or aching pain in the perineum and testis.
- (c) Constipation usually. Defæcation is often painful and may be accompanied by prostatorrhœa.
- (d) The patient is generally markedly neurasthenic.
- (e) *Per rectum* the prostate is tender and slightly swollen. Pressure upon the gland often causes a yellowish discharge to appear at the external meatus and the presence of pus and organisms in this secretion clinches the diagnosis.

The treatment is by attention to the general health and to any causal factor. Prostatic massage followed by irrigation once or twice weekly is the best local treatment but diathermy is also of value.

Describe Tuberculosis of the Prostate.

This disease is mainly found in young adults, being usually secondary to tuberculosis of the epididymis or

seminal vesicle. It may affect either the periurethral or the peripheral area of the organ. Caseous nodules are formed in the gland which can often be recognised on rectal examination. Subsequently, irregular abscesses develop, which usually discharge into the urethra.

Its signs and symptoms are those of uro-genital tuberculosis.

Describe Senile Hypertrophy of the Prostate.

This condition occurs after fifty years of age. Many theories have been suggested but we are still absolutely in the dark regarding its etiology. The middle lobe is most often involved but the lateral lobes are also commonly affected and lateral and middle lobes may be enlarged simultaneously. The enlarged gland is surrounded by a thin layer of condensed prostatic tissue, the false capsule, which can be readily separated from the diseased area as there is a well marked line of cleavage. On section the prostate shows small islands of acinar hyperplasia bounded by healthy tissue and the amount of fibrosis is variable. In cases with marked hyperplasia of the stroma the prostate is usually small and firm—the fibrous prostate.

Symptoms are not due to the size of the gland but to the effect its enlargement produces on the bladder. Lateral lobe enlargement has little or no effect but the enlarging middle lobe grows upwards and pushes aside the internal sphincter and projects into the bladder (covered by bladder mucosa) immediately behind the internal meatus. This projection leads to the formation of a retro-prostatic pouch into which the ureters open. The posterior wall of the urethra is elongated and the urethra narrowed. The residual urine in the retro-prostatic pouch is liable to infection.

What are the Chief Complications ?

The chief complications of senile enlargement are (a) hypertrophy and fascienulation of the bladder ; (b) dilatation of the bladder ; (c) diverticula of the bladder, the common sites being just external to the ureteral orifices ; (d) stagnation of the residual urine, leading to septic cystitis and stone formation ; (e) chronic interstitial nephritis may

develop in old-standing cases ; (f) acute retention of urine may occur from sexual excesses, alcohol, or exposure to cold ; (g) hydronephrosis ; (h) renal failure.

Give the Clinical Features.

The leading features are :—

- (a) Rising to micturate at night.
- (b) A difficulty in beginning the act.
- (c) Diminished force of the stream.
- (d) Escape of urine after the act is apparently completed.
- (e) Attacks of hæmaturia.
- (f) Increased frequency of micturition.

The diagnosis is verified by examination *per rectum*, by the cystoscope and by passing a catheter after micturition and so confirming the presence of residual urine.

Describe the Treatment.

In mild cases without complications a regular and careful life avoiding chills, alcoholic and sexual excess may be sufficient.

In more severe cases operation is required. It must not be carried out until the urinary excretion is normal as shown by means of input and output charts, urea concentration in the urine and blood urea estimation. In cases of acute retention the bladder must be slowly decompressed lest suppression of urine occur and the operation on the prostate is deferred until excretion is normal.

The operations are :—

- (a) Suprapubic prostatectomy with drainage.
- (b) Prostatectomy with closure and indwelling urethral catheter (Harry Harris).
- (c) Transurethral resection by M'Carthy resectoscope.

The second should not be employed in the presence of infection and the third is most suitable for middle lobe enlargements.

Describe Carcinoma of the Prostate.

Pathologically, three varieties of cancer can occur in the prostate, (a) scirrhus, (b) encephaloid, and (c) adenocancer. The disease spreads to the surrounding tissues, especially those around the base of the bladder. *Per rectum*, the gland is fixed hard and irregular, and in some cases adherent to the bowel. The secondary deposits are most frequently found in bones, thus leading to pathological fracture.

Clinical Features.—The symptoms closely resemble those of senile enlargement. Hæmaturia may be present, when it occurs independently of micturition, and apart from the passage of an instrument, it is a valuable diagnostic sign. Referred pains are very common, especially along the great sciatic nerve. The disease usually progresses slowly.

Treatment is by trans-urethral resection to combat the obstruction and by X-ray therapy.

THE PENIS.*What is Phimosis?*

This is a condition in which the prepuce is incapable of retraction so as to expose the glans penis. The prepuce is long, and its orifice contracted. Phimosis may be either congenital or acquired. It may result in :—

- (a) Retention of the sebaceous secretion, setting up irritation and balanitis.
- (b) Interference with micturition ; this may lead to backward pressure and partial retention with their sequelæ.
- (c) The constant straining may result in prolapse of the rectum, hernia, etc.
- (d) Paraphimosis.

The treatment is circumcision.

Describe Paraphimosis.

In this condition the prepuce has been forcibly drawn back, and the contracted ring slips into the sulcus behind the corona, thus preventing the return of the prepuce to its

original position. The result is congestion and great œdema, forming a large round collar-like swelling in front of the constriction. Behind this, the skin and subcutaneous tissues are also swollen : therefore there are two swellings separated by a deep, narrow sulcus, in the floor of which is the tight ring of the prepuce. Later, the glans penis becomes distended.

The treatment is to reduce the paraphimosis manually by gentle traction with the fingers and by the pressure of the thumbs on the glans. Should this fail the constricting ring is divided. Circumcision should be performed later to prevent recurrence.

What are Penile Warts ?

These papillomata occur as multiple red vascular growths around the corona, on the glans penis, or on the inner aspect of the prepuce. In the great majority of cases they result from the irritation of a gonorrhœal discharge ; a certain number however are secondary to repeated attacks of balanitis.

Large warts are snipped off under local anæsthesia, while the small variety frequently disappear after the application of a suitable dusting powder such as calomel and boracic acid. Circumcision should be performed subsequently.

Describe Cancer of the Penis.

Cancer of the penis is always a squamous epithelioma. It usually originates on the dorsum of the glans, and is most common after the age of fifty. Commencing as a small hard wart, the cancer quickly forms a rough fissured cauliflower-like tumour, which ulcerates, leading to hæmorrhage and an offensive discharge. In time the body of the penis is infiltrated ; the urethra however usually escapes. The inguinal glands are the first to become involved, and then the glands along the external iliac artery. If seen early, partial amputation of the penis, with free removal of both sets of inguinal glands should be carried out. In advanced cases the whole penis must be removed, together with the

inguinal and the external iliac glands ; the urethra is stitched to the skin in the middle line of the perineum.

THE TESTIS AND SPERMATIC CORD.

Describe Epithelioma of the Scrotum.

Scrotal epithelioma results from irritation by soot or paraffin. The cancer is hard and warty, and grows slowly at first. At a later period however the growth extends more rapidly, and the inguinal lymphatic glands become involved.

Early and free excision of the affected area, together with removal of the inguinal glands, is the most suitable treatment.

What are the Varieties of Abnormal Descent of the Testis ?

There are three varieties of abnormal descent, namely :—

- (a) Retention within the abdominal cavity—*cryptorchism*.
- (b) Retention within the inguinal canal—*imperfectly descended testis*.
- (c) Descent into some part other than the scrotum—*ectopia testis*.

The varieties of ectopia testis are :—(a) pubic, (b) perineal, (c) abdominal, (d) saphenous or crural.

Give their Clinical Features.

Abnormal descent is often complicated with either a congenital hernia, a congenital hydrocele, or torsion of the spermatic cord. When situated in the inguinal canal, or in some abnormal position, the testis is exposed to injury, and acute orchitis may be set up.

Abnormal descent is usually found on the right side. The scrotum is small, and the corresponding testicle absent. The testicle can be palpated when imperfectly descended or misplaced, and testicular sensation elicited. Dragging or neuralgic pains along the spermatic cord may prove a troublesome symptom.

When both testicles have failed to descend, the patient may present a feminine appearance.

What is the Treatment ?

In children before the age of puberty hormone therapy by weekly injections of Pregnyl may be of value in some cases, the testis increasing in size and reaching the scrotum. If this is not successful or if a hernia is present operation should be advised and after the removal of the sac and division of the coverings the vas and vessels are freed as far as possible and the testis placed in the scrotum where it may be fixed in many different ways (orchidopexy). If orchidopexy is impossible the testis should be removed.

Give the Pathology of Acute Epididymitis.

Acute epididymitis is secondary to some septic infection of the urethra, the organisms reaching the epididymis *via* the vas deferens. The disease most commonly follows gonorrhœa ; other causes are, the passage of septic urethral instruments, and urethral calculi. The gonorrhœal form occurs when the infection has invaded the posterior urethra. It is generally unilateral. Only in rare instances does suppuration occur, or atrophy of the testis result from an attack.

What are the Clinical Features ?

- (a) Elevation of the temperature, often with a preliminary rigor.
- (b) Nausea, vomiting, and constipation.
- (c) Great, pain, leading to insomnia.
- (d) Disappearance of the urethral discharge.
- (e) On examination *per rectum*, the corresponding seminal vesicle and the prostate, are often felt to be swollen and extremely tender.

Locally notice the :—

- (a) Edematous red scrotum.
- (b) Swollen and thickened spermatic cord.
- (c) Swollen and tender epididymis.
- (d) Often an acute hydrocele between the epididymis and the testicle.

The treatment is that of the cause. The patient is kept in bed with soothing applications locally and the scrotum should be supported and elevated. Chemotherapy is of great value in suitable infections.

Describe Acute Orchitis.

In acute orchitis the infection reaches the testicle through the blood stream. The disease is generally secondary to either mumps, influenza, scarlet-fever, malaria, or gout. An attack of mumps is frequently followed by acute orchitis, the testicular infection occurring at the end of the first week. Like acute epididymitis, testicular inflammation is usually unilateral (except in the gouty form), and does not end in suppuration, but is often followed by atrophy.

Signs and Symptoms.—The constitutional symptoms are usually masked by those of the causal agent; the local features are :—

- (a) Oedematous red scrotum.
- (b) Swollen and painful testicle.
- (c) Normal epididymis and tunica vaginalis (except in the gouty variety).
- (d) Often a mucopurulent discharge from the urethra.

The treatment is similar to that of acute epididymitis.

Describe Malignant Disease of the Testis.

Malignant disease of the testis is usually either a cancer, a sarcoma, or a teratoma. The most common age is between twenty-five and forty. The lumbar lymphatic glands are affected, and, when the scrotum becomes involved in the disease, the superficial inguinal glands are invaded in addition.

Clinical Features.

- (a) There is frequently a distinct history of trauma.
- (b) A testicular swelling forms which is not painful.
- (c) Absence of testicular sensation.
- (d) Rapid rate of growth, the epididymis being early involved in the disease.

- (e) An acute hydrocele or even a hæmatocele may develop.
- (f) Engorgement of the spermatic veins often occurs.
- (g) Later, the scrotum becomes adherent to the testicle, and ultimately gives way—fungus testis.

Early removal of the testis and the affected glands is the only feasible treatment.

Give the Leading Features of Syphilis of the Testis.

Syphilitic disease of the testis may occur in either the acquired or the congenital variety. It is a tertiary manifestation. Pathologically, two conditions are commonly present, namely, gummata and diffuse interstitial sclerosis. In congenital syphilis, sclerosis is the chief feature : in acquired syphilis both gummata and sclerosis are present.

Clinical Features.

- (a) A history of syphilis, or the presence of syphilitic lesions elsewhere.
- (b) A slowly growing painless swelling in the scrotum.
- (c) The swelling affects the testicle, not the epididymis, the latter becoming adherent to the testis.
- (d) On palpation, the testicle feels hard, like a piece of wood.
- (e) The spermatic cord is not thickened.
- (f) A hydrocele forms in the early stages ; it is subsequently absorbed.
- (g) Testicular sensation is lost.
- (h) Should the skin become involved typical gummatous ulcer will result.

The usual anti-syphilitic measures should be adopted.

Describe Tuberculous Disease of the Epididymis and Testis.

The disease commences in the epididymis, and later implicates the testicle. It is frequently of the bovine type, and secondary to tuberculous adenitis. The bacilli usually reach the epididymis by the blood stream. Pathologically, as in tubercle elsewhere, small nodules are formed, which

subsequently cascade. Tuberculous disease of this organ is usually found in young adults. It is a very insidious complaint, as there are practically no constitutional symptoms.

Give the Clinical Features.

- (a) A small hard nodule develops in the epididymis : it slowly increases in size.
- (b) The swelling is not painful.
- (c) Testicular sensation is retained.
- (d) Dragging pains along the spermatic cord.
- (e) A small hydrocele often forms.
- (f) The testicle, epididymis, and scrotum adhere to each other in advanced cases ; fungus testis may occur.
- (g) The spermatic cord is thickened, and the vas deferens feels especially hard.
- (h) On rectal examination tuberculous changes are frequently found in the prostate, and the corresponding seminal vesicle.

What are the Indications for Surgery ?

In early unilateral cases with no obvious extension orchidectomy should be performed. Orchidectomy is also worth considering in more acute cases to prevent sinus formation and mixed infection.

Describe Varicocele.

Varicocele is a dilated varicose condition of the internal spermatic veins or pampiniform plexus. It is more frequent on the left than on the right side and tends to disappear in adult life.

Several reasons have been urged as an explanation of its greater frequency on the left ; they are (a) the relative lengths of the internal spermatic veins—the left being the longer ; (b) the mode of termination of the veins—the right obliquely into the inferior vena cava ; the left at right angles into the left renal vein ; (c) the pressure of the faecal contents of the iliac colon on the left vein ; and (d) the anastomosis of the left veins with the hæmorrhoidal veins.

Mention the Clinical Features.

(a) A feeling of fulness in the scrotum and dragging pains along the spermatic cord ; these are generally relieved on the patient assuming a recumbent position.

(b) A thrill is felt in the veins when the patient coughs.

(c) The swelling disappears when the scrotum is elevated, and the patient lies down. Place the finger on the external abdominal ring, and direct the patient to stand up—the veins refill.

(d) On palpation the scrotum and its veins feel like a bag of worms.

Give the Treatment.

The palliative measures to be employed are cold sponging, and the wearing of a suspensory bandage. The radical operation should be performed ; (a) if the patient desires to enter the public services or to reside abroad ; (b) if there is marked pain ; or (c) if he is mentally perturbed. “ Hypochondriasis tends to fix the patient’s attention upon these

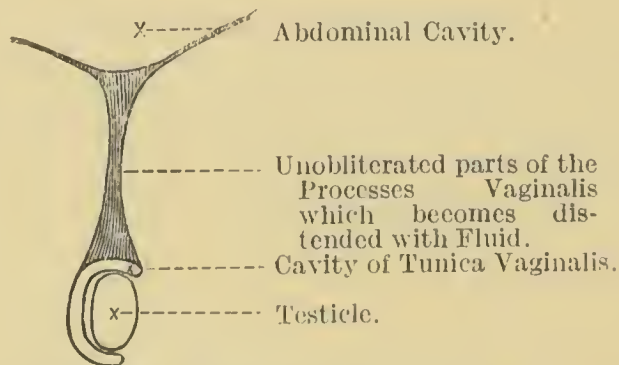


FIG. 31.—ENCYSTED HYDROCELE OF CORD.

To show the condition of the Processus Vaginalis in Encysted Hydrocele of the Cord.

veins. He accuses himself of having caused it by early sexual excitation, which is quite incorrect. He fears it may result in impotence, which it does not. He dreads sterility, for which there is likewise no solid grounds.” (Walsham.)

The operation consists in exposing the internal spermatic veins by an incision over the external abdominal ring, and resecting an inch or more of the plexus. Be careful not to injure the vas deferens and its accompanying vessels.

What is Encysted Hydrocele of the Cord ?

Encysted hydrocele of the cord results from a partial failure of the processus vaginalis to become obliterated. Only the upper and lower segments are occluded ; the intervening portion is patent. A serous effusion occurs into this space, which may give rise to a circumscribed or an elongated smooth, elastic swelling occupying the inguinal canal. The condition is more frequently met with on the right than on the left side. This variety of hydrocele usually disappears during infancy.

Enumerate the Varieties of Hydrocele of the Tunica Vaginalis.

The varieties of hydrocele of the tunica vaginalis are :—

A. ACUTE

Congenital.—The processus vaginalis is open, and therefore communicates with the peritoneal cavity.

B. CHRONIC

Acquired.—The processus vaginalis is completely obliterated.

Infantile.—The processus vaginalis is entirely obliterated at its upper end.

Inguinal.—A hydrocele associated with an undescended testicle.

The acquired variety forms a swelling anterior, lateral, above and below the testis. The disease manifests itself, usually without any obvious cause, in middle age. There are two chief theories, namely that it is (a) an inflammatory reaction, or (b) that it results from passive congestion.

What are the Characters of Hydrocele Fluid ?

COLOUR . . . Pale yellow or amber coloured. In old cases it often has a glistening or sparkling appearance, due to the presence of cholesterin crystals, the result of fatty changes.

REACTION . . . Neutral, or faintly alkaline.

SPECIFIC GRAVITY . 1024.

COMPOSITION . Contains a little fibrinogen, and about 6 per cent. of albumin, and a small amount of NaCl. The fluid does not coagulate spontaneously.

Contrast Acquired Hydrocele and Scrotal Hernia.

An acquired hydrocele must be distinguished from a scrotal hernia ; the chief points of difference are given in the following table :—

| SCROTAL HERNIA. | ACQUIRED HYDROCELE. |
|--|--|
| <ol style="list-style-type: none"> 1. The tumour is oblique in shape and direction. 2. The protrusion lies in front of, and covers the spermatic cord, and the testicle can be felt at the bottom of the scrotum. The scrotum cannot be folded up on the abdomen as in a hydrocele. 3. An impulse is imparted to the tumour if the patient coughs : a gurgling sound is heard on attempts at reduction ; on percussion the note is clear, if intestine, but dull if omentum. 4. No transparency on examination by transmitted light, except in children. | <ol style="list-style-type: none"> 1. The tumour is oval or pyriform, and begins at the bottom of the scrotum. 2. The constituents of the cord can be felt free in the inguinal canal at the external ring. The testicle cannot be felt at the bottom of the scrotum, for it is situated behind the swelling. 3. No impulse on coughing ; no gurgling on attempts at reduction ; the percussion note is dull. It is possible to feel the rounded upper end of the tumour. 4. It is usually transparent when thus examined ; a thick tunica vaginalis is not transparent. |

A scrotal hernia and a hydrocele however frequently co-exist.

Give the Treatment of Hydrocele.

The treatment of the hydrocele consists in tapping, or in performing the radical operation.

In tapping a hydrocele, grasp the swelling with the left hand, so that the testicle lies in the centre of the palm. Hold the trocar in the right hand, with the index finger about three-quarters of an inch from its tip (to prevent it entering too far) and with the thumb on the flange to press the

cannula home ; plunge it with a sudden thrust into the most prominent part of the front of the scrotum. It is first introduced at right angles, and then made to pass up obliquely after entering the sac.

Two precautions to be taken are (*a*) avoid any obvious large veins, and (*b*) make sure it is not a case of inversion of the testicle—*i.e.* the testicle lying in front, instead of at the back. The position of the testicle is made out by the “testicular sensation” produced by gently squeezing the organ. Operation consists of the excision of the excessive tunica and its eversion and suture behind the testis.

After tapping cover the puncture wound with a little collodion.

What is a Hæmatocele ? Give its Causes.

This is an effusion of blood into the cavity of the tunica vaginalis. It may be caused by :—

- (*a*) Trauma to the testis.
- (*b*) Chronic inflammation of the tunica vaginalis.
- (*c*) Puncture of a small vein in tapping a hydrocele.
- (*d*) Malignant disease of the testis.

When the effusion coagulates, it is deposited upon the walls of the cavity. There is no transparency on examination by transmitted light.

Contrast Hæmatocele and Malignant Disease of the Testis.

It is necessary to distinguish between hæmatocele and malignant disease of the testis. Hæmatocele (*a*) appears suddenly ; (*b*) does not involve lymphatic glands ; (*c*) does not lead to thickening of the spermatic cord ; and (*d*) does not cause a loss of testicular sensation.

Give the Treatment for Hæmatocele.

In recent cases the patient should be placed in bed, the scrotum supported upon a pillow, and an ice-bag applied to the parts. After a few days have elapsed the blood may be removed by tapping with strict asepsis, but if absorption does not occur the radical operation for hydrocele should be performed before there is infection of the extravasated blood.

Describe Spermatoceles.

Spermatocelles arise in the vicinity of the epididymis, either between the globus major and the testis, or above the globus major outside the tunica vaginalis. They are usually unilocular. Their gradual development separates the testis and epididymis. They have a fibrous wall lined by epithelium and contain a milky fluid in which motile spermatozoa may be found. There are two theories to explain their origin (*a*) they are retention cysts of the vasa efferentia ; and (*b*) they arise from certain foetal relics called Kobelt's tubules. They grow slowly and painlessly. A spermatocoele may be mistaken for a third testicle.

The treatment is to excise the spermatocoele.

Describe Torsion of the Cord.

Cases of torsion result from mal-development of the cord ; the testicle hangs free in the cavity of the tunica vaginalis, and the constituents of the cord are separated instead of being connected into a bundle. Exciting causes are (*a*) the venous hypertrophy which occurs at puberty, (*b*) a sudden contraction of the cremaster muscle, (*c*) lifting heavy weights, and (*d*) violent expiratory efforts such as coughing or the blowing of wind instruments.

Give its Clinical Features.

There are two varieties of torsion (*a*) acute, and (*b*) recurring. The clinical features vary according as the testis is fully descended, or is retained in the inguinal canal. In the former case the symptoms are those of an epididymo-orchitis, *i.e.* pain, swelling, extreme tenderness, and slight fever. Exclude gonorrhœa and mumps before diagnosing torsion.

The treatment is by operation. The twist of the cord is undone and, if viable, the testis is replaced and fixed in the scrotum. If not viable the testis should be removed.

THE URETHRA.*Urethritis.*

Urethritis is usually due to the presence of the gonococcus, but may occasionally result from the presence of staphy-

lococci or even the bacillus coli communis. The condition is described in the Venereal Diseases Catechism.

Describe Malformations of the Urethra.

Malformations of the urethra comprise either defects in the roof—epispadias, or defects in the floor—hypospadias. In the former deformity the urethra opens on the dorsum of the penis. Complete epispadias is associated with ectopia of the bladder (*see page 243*). When incomplete the penis is small and bent upwards towards the abdomen. The malformation can be corrected by means of a plastic operation.

Three varieties of hypospadias are described according to the position of the external urethral orifice. In each case this will be on the under surface of the genitals. The varieties are (*a*) glandular, the opening being at the junction of the glans with the body of the penis; (*b*) penile, when the meatus lies just in front of the scrotum; and (*c*) perineo-serotal, the urethra opening upon the perineum. The last-named deformity is complicated by gross malformation of the external genitals (external pseudo-hermaphrodite). In the penile deformity, the penis is curved towards the perineum.

For the operative treatment of these defects a work on operative surgery must be consulted.

Classify Urethral Strictures.

Urethral strictures can be classified according to their origin, shape, nature, and ability to admit an instrument.

A. Origin :—

- | | | |
|-----------------|---|---------------|
| (a) Cicatricial | { | Traumatic. |
| | | Inflammatory. |
| (b) Spasmodic. | | |
| (c) Congestive. | | |

Traumatic strictures result from rupture of the urethra, by falling upon a hard substance with the thighs abducted, kicks on the perineum, and fractures of the pelvis. The urethra usually tears at the junction of the bulbous and membranous portions.

Inflammatory strictures are usually gonorrhœal in nature, but may follow a non-specific urethritis.

Spasmodic and congestive strictures affect the membranous urethra. The former is occasioned by spasm of the compressor urethra muscle. They cause retention of urine.

B. Shape :—

(a) Annular.

(b) Bridle, when the stricture forms a band across the urethral channel.

(c) Tubular.

C. Nature :—

(a) Callous.

(b) Resilient. This is a variety of stricture which dilates very easily up to full size, then quickly contracts again like a piece of india-rubber.

D. Ability to admit an instrument :—

(a) Permeable.

(b) Impermeable.

Give the Clinical Features.

One of the earliest symptoms is a difficulty in beginning to pass water, and the flow is less vigorous than normal. Increased frequency of micturition may be complained of. There may be a gleet discharge and dribbling at the end of the act. Sometimes there are changes in the size, shape, and direction of the stream—it is forked and twisted. Then from some slight cause, as exposure to cold or indulgence in alcohol, complete retention comes on from the superadded inflammation or spasm. The chief points in diagnosis are the inability to pass an ordinary-sized catheter and localisation of the stricture by urethroscopic examination.

What are the Results of a Urethral Stricture ?

The results of a stricture in the urethra are manifold. They may be grouped as follows :—

(a) *In the urethra behind the stricture.*—Dilatation of the tube occurs, the mucous membrane becomes inflamed and often ulcerates. Peri-urethral abscesses and fistulæ may follow. The urethra may rupture owing to the patient straining during micturition.

- (b) *In the bladder*.—Hypertrophy of the muscular coat ; diverticula of the mucous membrane may form. Cystitis often occurs.
- (c) *In the ureters*.—These become dilated and thickened.
- (d) *In the kidneys*.—Chronic interstitial nephritis is often brought about ; pyelo-nephritis and pyo-nephrosis are frequent sequelæ of a urethral stricture.

What Methods of Treatment may be adopted ?

- (a) Intermittent dilatation.
- (b) Continuous dilatation.
- (c) Excision of the stricture.
- (d) Internal urethrotomy.
- (e) External urethrotomy by the method of Syme or Wheelhouse ; the latter is used when the stricture is impermeable.

Describe Intermittent Dilatation.

In intermittent dilatation, introduce a metal bougie along the urethral canal until the instrument engages in the stricture, work very cautiously, especially when near the triangular ligament, or a “false passage” will be formed, and the bougie pass between the rectum and the prostate. It is often an advantage to control the bougie by keeping the left forefinger in the rectum.

A larger size is next introduced, and so on until a No. 12 or 13 can be passed. The patient rests for two or three days, and on his next visit the surgeon begins with the size *below* the largest one passed previously ; then the same size, and the one above it. Never omit a size.

See that the patient empties his bladder before any instruments are introduced into the urethra. Also give him a drink of hot water and ten grains of antipyrin in order to prevent “urethral” fever.

Describe Continuous Dilatation.

Continuous dilatation is employed when acute retention of urine co-exists ; it is inferior to intermittent dilatation, and may result in peri-urethral cellulitis. Catheters are used instead of bougies. Introduce the largest catheter

possible, tie it in position and leave it for a day. At the next sitting it will be found that the stricture will allow a larger size to be passed. Leave this in for twenty-four hours, and so on, until the stricture is fully dilated.

What is Internal Urethrotomy ?

Internal urethrotomy consists in dividing the stricture with a urethrotome. It is a useful method for resilient and bridle strictures. It is contra-indicated when any peri-urethral cellulitis is present. The subsequent treatment is to pass a full-sized bougie every six weeks.

Give the Indications for External Urethrotomy.

- (a) Impermeable stricture.
- (b) Peri-urethral sepsis.
- (c) Urinary fistulæ.
- (d) Traumatic stricture.
- (e) Callous stricture.
- (f) When internal urethrotomy is impossible or has failed.

What methods are employed ?

Syme's operation is used when the stricture is permeable by the Syme's staff. In impassable strictures Wheelhouse's operation is performed.

What are the Complications of Stricture ?

- (a) Acute retention.
- (b) Peri-urethral cellulitis or abscess.
- (c) Urinary extravasation.
- (d) Urinary fistulæ.

Describe Retention of Urine.

Retention must not be confused with suppression of urine ; in the latter no urine is secreted and the bladder is empty. Retention arises from either (a) obstruction to the urinary stream, such as enlarged prostate, vesical or urethral calculus, and stricture ; or (b) from inability of the bladder wall to contract. This inability is often seen in spinal injuries and diseases ; it may also occur reflexly after opera-

tions upon the rectum and anal canal, and may arise in hysterical subjects.

When an organic stricture of the urethra is present, exposure to cold, or an alcoholic debauch is very apt to induce an attack of retention.

Give the Clinical Features.

- (a) A complaint of inability to pass urine.
- (b) When the condition occurs suddenly, acute pain is experienced.
- (c) Distention of the bladder ; the viscus forming a suprapubic swelling which is dull on percussion.

What is the Treatment ?

When the condition is not very urgent, a hot sitz-bath, or where this is impracticable, a hot sponge applied just above the pubes, together with the administration of a morphia and belladonna suppository, can be tried. Should these measures fail, an attempt must be made to pass a catheter. When stricture exists, the urethra is gently dilated with a small bougie until it will admit a No. 5 catheter. If great distension of the bladder has occurred, be careful not to empty the viscus rapidly or suppression of urine may follow.

In cases where it has proved impossible to pass a catheter, suprapubic aspiration or cystostomy will be necessary. In post-operative retention the injection of esmodil or doryl by stimulation of the parasympathetic may cause the bladder to contract.

Describe Urinary Extravasation.

Urinary extravasation may either result from a traumatic rupture of the urethra, or as a complication of a stricture ; it can involve either the anterior or the posterior urethra.

When the anterior urethra is the site of rupture the urine escapes into the superficial perineal pouch, where its subsequent course is influenced by the attachments of the fascia of Colles.

This is the deep or membranous layer of the superficial fascia of the perineum. It is fixed behind to the base of the triangular ligament ; laterally to the conjoined ischial and

pubic rami ; anteriorly it is free, and is continued upwards as part of the scrotum on to the anterior abdominal wall, where it becomes continuous with the fascia of Scarpa. The fascia of Scarpa descends over the inguinal ligament to blend with the fascia lata of the thigh about half an inch below the ligament. As will be seen, the urine must travel upwards, and collect in the loose cellular tissue of the scrotum and lie superficial to the muscles of the anterior abdominal wall.

In rupture of the posterior urethra, urine may either pass forwards into the superficial perineal pouch, or collect round the neck of the bladder and in the space of Retzius.

Give the Signs and Symptoms.

- (a) A burning or pricking sensation in the perineum.
- (b) Later, the anterior part of the perineum, the scrotum, and the root of the penis swell.
- (c) The skin of the affected region assumes a dusky-red tint, and sloughing occurs.
- (d) Constitutional disturbances due to the absorption of septic materials.

What is the Treatment ?

Try to pass a catheter and if this fails perform suprapubic cystostomy. Multiple incisions are then made through the deep layer of fascia throughout the area of extravasation.

THE THORAX.

Give Definitions of the following Conditions :—

PNEUMOTHORAX.—Air in the pleural cavity ; usually results from injury, as fracture of the ribs, foreign bodies, violent muscular effort, and may be secondary to the various forms of phthisis—from perforation.

HÆMOTHORAX.—Effusion of blood into the pleural cavity ; generally from a wound of the intercostal vessels, or of the lung substance.

SURGICAL EMPHYSEMA.—Air in the subcutaneous tissue ; frequently from fracture of the ribs. It is often associated

with pneumothorax and collapse of the lung. The skin of the affected area crepitates on palpation.

HYDROTHORAX.—Effusion of serum into the pleural cavities ; a dropsy rather than an acute effusion such as is found in pleurisy. It is generally bilateral.

EMPYEMA.—A collection of sero-purulent or purulent fluid in the pleural cavity. Two varieties are described, pyogenic and tuberculous.

Describe Paracentesis Thoracis.

Paracentesis thoracis consists in tapping the chest for the removal of serous or purulent fluid. A point is chosen in the 7th or 8th intercostal space, a little external to the angle of the scapula. The needle is pushed into the chest close to the edge of the *lower* rib in the space chosen ; this avoids wounding the intercostal artery which lies near the lower border of the upper rib of the space. The fluid must be allowed to issue slowly.

Where is the Pericardium tapped ?

In the 5th space on the left side close to the sternum, or $1\frac{1}{2}$ inches away from it, in order not to injure the pleura or the internal mammary vessels. Use a very fine needle, and draw off *very slowly*. When the effusion is purulent, it is better subsequently to incise and drain the pericardium.

Describe Wounds and Injuries of the Chest.

Injury of the chest contents may follow penetrating wounds or may occur in crush injuries causing fracture of some part of its bony walls and in children even without fracture. Injury to the lungs from the blast of high explosives may occur without any other injury.

Hæmothorax is not as a rule severe unless there is rupture of a vessel in the parietes. Pneumothorax may be of the tension type and will require urgent aspiration in closed cases or immediate sealing off of the wound in penetrating valvular wounds. To and fro wounds also require sealing as a first aid measure.

Injuries to the upper abdominal viscera or the diaphragm may also be present.

The heart may be injured in stab wounds and the pericardium becomes filled with blood and the heart sounds become fainter and blood pressure falls. Operation to suture the wound is required.

What are the Causes of Empyema Thoracis ?

Pyogenic empyema may arise

- (a) *Secondary to pulmonary disease.*—It follows lobar pneumonia, may arise during bronchopneumonia, may result from the rupture of a lung abscess or bronchiectatic cavity.
- (b) *Traumatic.*—Blood spread infection of a hæmothorax.
- (c) *Secondary to upper abdominal disease, e.g. subphrenic abscess.*
- (d) *Secondary to acute infective fevers, e.g. typhoid.*

Empyema is also common in pulmonary tuberculosis.

What are the Common Organisms ?

There are two common organisms (a) the pneumococcus, (b) the streptococcus. Other organisms such as bacillus coli and gas forming bacteria may be found and mixed infection is the rule in post-abdominal and lung abscess cases.

The pneumococcal empyema following lobar pneumonia forms a localised abscess in the pleural cavity the streptococcal case is usually diffuse.

What are the Clinical Features ?

- (a) Persistence or relapse of fever in pneumonia.
- (b) Dyspnoea.
- (c) Rapid pulse.
- (d) Rigors frequent in children.
- (e) Pain. Sometimes bulging of intercostal spaces in children.
- (f) Loss of movement of affected side of chest.
- (g) Absent or diminished breath sounds.
- (h) Diminished vocal fremitus and resonance.
- (i) Dullness on percussion.
- (j) Displacement of heart to opposite side.

- (k) Polymorph leucocytosis.
- (l) The X-ray will show the extent of the effusion and of the cardiac displacement.
- (m) Aspiration clinches the diagnosis.

What is the Treatment ?

The choice of treatment must depend on the result of aspiration. Should the pus be thick and creamy the empyema is certainly localised and probably pneumococcal in type and treatment is by rib resection and closed drainage.

Should the pus be thin and serous or anaerobic, aspiration should be repeated every two days until the pus becomes thick and localisation has occurred when rib resection is carried out.

The drainage tube should remain until full expansion of the lung has taken place.

Describe Lung Abscess.

A localised abscess may occur in the lung from aspiration of septic material, obstruction of a bronchus with resulting stasis and infection distal to it or by direct spread from another focus, *e.g.* subphrenic abscess. It follows inflammation of a wider area of the lung and the pus on culture shows a mixed infection. The clinical features are cough, pain in the chest, rise of temperature, sweating and later foul expectoration. Hectic fever continues and the patient becomes toxic and anæmic. The diagnosis depends on radiography as the physical signs are variable. The X-ray at first shows a rounded or wedge-shaped shadow and only after the abscess has ruptured into a bronchus is the typical fluid level seen.

Treatment is by general measures to increase resistance, postural drainage and bronchoscopic aspiration. If these fail surgical drainage must be performed.

Name the operations employed in the treatment of diseases of the chest and mention some of their indications.

- (a) *Intercostal drainage*.—Used in the early stages of streptococcal empyema and in empyema in young children and infants.

- (b) *Rib resection and drainage*.—The operation of choice in all localised empyemas.
- (c) *Decortication of lung*.—By incision of the visceral pleura. Used in some cases of chronic empyema.
- (d) *Artificial pneumothorax, i.e.* the introduction of air into the pleural cavity. Used in tuberculosis to secure collapse and therefore rest for the lung and also for diagnostic purposes in localising tumours or cysts by radiography. Collapse may be prevented by adhesions.
- (e) *Thoracoscopy and division of adhesions*.—The instrument is passed through an intercostal canula and under vision suitable adhesions may be divided by a cautery inserted through another canula.
- (f) *Phrenic Paralysis*.—Temporary paralysis by crushing the nerve and permanent by its evulsion. Secures greatest collapse of lower and middle areas and is used in tuberculosis.
- (g) *Thoracoplasty*.—Aims at removing sufficient area and number of ribs to ensure permanent collapse. Used in tubercle, chronic empyema, old standing bronchiectasis.
- (h) *Lobectomy and pneumonectomy*.—Removal of a lobe or the whole lung. Indicated in cases of bronchiectasis, old standing lung abscess and tumour.

THE BREAST.

Mention the chief Malformations of the Breast.

- AMAZIA . = Congenital absence of either or of both mammae.
- ATHELIA . = Congenital absence of the nipples.
- MICROMAZIA = Non-development of the breasts at puberty.
- POLYMAZIA }
AND } = The presence of supernumerary breasts or
POLYTHELIA } nipples.
- GYNECOMAZIA = A hypertrophic condition of the breasts, sometimes found in males.

Describe Mammary Abscesses.

The puerperal forms of mammary abscess are divided into two classes, pre-mammary and intra-mammary. They are caused by the staphylococcus pyogenes aureus. A retro-mammary abscess usually results from an empyema, or from an infection of a hæmatoma, or from tuberculous disease of a rib.

Intra-mammary abscesses are of more frequent occurrence than the other two varieties.

What are the Symptoms of Intra-mammary Abscesses ?

Severe lancinating pains during lactation ; later, as pus forms, the pain is of a throbbing character. The temperature rises to 101° or 102° F. Headache and gastro-intestinal derangements are usually present.

Locally, the breast is exquisitely tender, swollen, and reddened. When pus has formed the colour takes on a dusky hue, and fluctuation can be recognised. Subsequently, the abscess reaches the surface, pointing in the vicinity of the areola.

What is the Treatment ?

Nursing must be stopped and the milk should be withdrawn from the affected breast, a full dose of Henry's solution being given to discourage further secretion or lactation may be inhibited by oestrogenic therapy. The abscess is opened by an incision radiating from the nipple to avoid the lactiferous ducts. A finger is inserted and all the loculi of the abscess opened up and good drainage secured.

Retro-mammary abscesses are opened by an incision in the thoraco-mammary fold.

Describe Chronic Mastitis.

Pathologically chronic mastitis is a fibrosis, due to a hyperplasia of the periacinar connective tissues : the subsequent contraction of the newly-formed connective tissue leads to atrophy of the secreting elements, and by occluding the milk-ducts, causes numerous retention cysts to form. In the former condition, periacinar or interstitial mastitis

results—in the latter, periductal mastitis or multiple cystic disease. These cysts, in the majority of cases, contain a clear coloured fluid.

In some areas the epithelial elements show hyperplasia instead of atrophy. This hyperplasia may take the form of papillomatous outgrowths into cysts or ducts and should be regarded as a precancerous condition.

The etiology is still in doubt but it is probable that it is due to a disturbance of the hormonal control of the changes in the breast which occur during each menstrual cycle.

What are the Clinical Features ?

The disease is mainly found in women near the menopause. The patient may complain of stinging pains shooting down the arms or towards the shoulder.

Besides a definite swelling, the breast has a knotty feeling. The swelling may suggest a scirrhus carcinoma but to distinguish, note :—

- (a) The nipple is rarely retracted.
- (b) The axillary glands, although often enlarged, are not hard or fixed.
- (c) The skin moves freely over the tumour and the mamma moves readily over the pectoralis major and its fascia.
- (d) On pressing the breast against the chest with the palm of the hand, the swelling disappears.

Give the Treatment for Chronic Mastitis.

Treatment must depend on accurate diagnosis. If there is the slightest doubt the treatment must be that of malignant disease. In mild cases support of the breast may be sufficient to relieve the pain. Beckwith Whitehouse advocates the use of oestrogens which are successful in many cases but there are many different preparations, *e.g.* stilboestrol, progynon, etc., and further progress must await standardisation of their potency and dosage. In cases which fail to respond X-radiation or excision may be required.

What is Mastodynia ?

A neuralgic condition of the mamma occurring in young neurotic females. The patient, in addition, usually complains of ovarian or uterine disturbances. The pain is markedly aggravated during menstruation. The treatment is to build up the general health, and rectify any pelvic disorder.

Small doses of oestrogen for three days beforehand may relieve the condition.

Describe Cysts of the Breast.

Cysts of the breast may be divided into four groups :—

- (a) The cysts of chronic mastitis.
- (b) Cysts due to degeneration of tumours—simple or malignant.
- (c) Galactoceles.
- (d) Hydatids—very rare.

Describe Galactocele.

A single cyst arising during pregnancy or lactation and found in the region of the areola. The cyst enlarges rapidly, is soft and elastic and its milky contents may be expressed from the nipple on pressure.

If aspiration fails the cyst may need to be excised.

Describe Paget's Disease of the Nipple and Areola.

This condition commences as a papillary dermatitis which is ultimately transformed into a carcinoma. It commences in the rete mucosum of the epidermis. It occurs in elderly women and at first may be mistaken for eczema. It may, however, be distinguished from the latter disease by the facts (a) itching is absent, and (b) vesicles do not form. The nipple and areola become bright red in colour. Frequently, retraction of the nipple occurs, and the axillary glands become secondarily infected. Microscopically, it is characterised by the presence of clear cells often multi-nucleated—Paget's cells.

Another theory holds that Paget's disease is secondary to a carcinoma situated in the subareolar region, and that the eczematous condition follows upon lymphatic permeation.

Treatment as soon as the diagnosis is established by the failure of local measures is excision of the breast which should be of the radical type if a tumour can be felt.

What are the Common Tumours of the Breast ?

| | | | | |
|-----------|---|----------------|---|---------------------------|
| BENIGN | { | Fibro-adenoma. | { | Intracanalicular. |
| | | | | Pericanalicular. |
| MALIGNANT | { | Carcinoma. | { | Encephaloid or medullary. |
| | | | | Scirrhus. |
| | | | | Atrophic scirrhus. |
| | | | | Duct carcinoma. |
| | { | Sarcoma. | | |

Describe Fibro-Adenoma.

Fibro-adenomata are small simple tumours which occur in young and frequently unmarried women. The two types, the pericanalicular and the intracanalicular are differentiated, only on pathological grounds and have the same clinical features. On section the pericanalicular type shows small acini lined by flattened cells surrounded and apparently compressed by well formed fibrous tissue whereas the intracanalicular type shows acini rendered irregular in shape and pulled out by the fibrosis. These tumours are known as hard fibromas. A rare tumour the soft fibroma occurs and is believed by some to originate in the intracanalicular type. The soft fibroma grows rapidly, often becomes cystic forming a papillary cyst-adenoma and readily fungates on the surface. In spite of its appearance it is a simple tumour.

A fibro-adenoma forms a small smooth swelling which is not attached to the skin or deeper structures. It is usually quite painless and its presence is noted by chance. There is no retraction of the nipple and the axillary glands are not involved.

The treatment is local excision of the tumour.

What are the Features of a Duct Papilloma ?

A duct papilloma arises in one of the larger ducts near the nipple and may follow prolonged lactation. It forms a small elastic swelling. As it takes origin from the duct wall

it is lined by cubical epithelium. The breast itself is unaffected. The main symptom is a serous or blood-stained discharge from the nipple. The diagnosis between papilloma and duct carcinoma is very difficult and as malignant change is possible the best treatment is excision of the breast.

Describe a Scirrhus Cancer.

It begins after thirty years of age, usually much later. The younger the patient, the more rapid the growth. The commonest site is the superior-external quadrant and the affected breast becomes a little *smaller* and slightly *elevated* as compared with the normal one. The tumour is stony hard, and later becomes fixed to the surrounding structures. On palpation, the tumour feels more evident when the breast is flattened against the chest by the surgeon's palm. At first there is no pain, but subsequently the pain becomes severe and constant.

The skin is puckered, and the nipple retracted if the cancer is near it. Ulceration takes place because the skin is infiltrated.

The glands of the axilla are enlarged, although in many subjects they cannot be definitely palpated.

In later cases the blocking of the skin lymphatics gives rise to the condition of *peau d'orange*.

What are the Chief Points to note ?

(a) The infiltrating mode of growth ; (b) the tendency to contraction, as shown by the withdrawing of the nipple and the puckering of the skin ; (c) the stony hardness and want of definition ; (d) the fixity ; (e) the glandular affection ; (g) the age of the patient.

What are its Varieties ?

The atrophic, and the form where the skin is chiefly affected, being full of nodular growths ; which are very leathery and hard—*scirrhus en cuirasse*.

What is the Appearance of a Scirrhus on Section ?

It “ cups ” on section, and when scraped a creaking sensation is noticed. The outer layer is a delicate grey—the zone

of multiplying cells ; the middle layer is white—the fibrous contracting layer. In the centre we find degenerated tissue and fatty yellowish streaks, the whole resembling an unripe pear.

Describe Atrophic Scirrhus.

Atrophic scirrhus commences very late in life, is extremely hard, grows very slowly, and is only feebly malignant. The skin over the tumour is adherent and puckered. The nipple is generally retracted. After the lapse of several years the axillary glands become involved.

What is an Encephaloid Carcinoma ?

The word encephaloid describes the brain-like appearance of this rapidly growing very cellular tumour with little or no evidence of any fibrous reaction. It occurs in younger women and early reaches the lymphatics so that peau d'orange is an early sign. Fungation is likely because of its rapid growth. The prognosis is bad.

What Factors must be considered in the Treatment of Carcinoma of the Breast ?

- (a) The type of tumour.
- (b) The extent both locally and at a distance, *i.e.* is the tumour operable ?
- (c) If inoperable can any palliative measures be employed.

What is the Treatment ?

In the encephaloid type of tumour and particularly in the acute carcinoma of lactation the outlook is very poor and lymphatic spread so rapid that radical operation is likely to be too late. Local excision of the fungating mass and deep X-ray therapy are indicated.

In the scirrhus type the tumour is operable if it is not fixed to the deeper tissues and the lymphatic glands in the axilla are not grossly enlarged or show any fixation. The radical operation may be performed and is followed by X-ray therapy.

Inoperable cases may be treated by X-radiation or by radium therapy.

Describe Duct Cancer.

This is the least malignant of mammary cancers (Bland Sutton). It develops in a cyst, usually from a pre-existing papilloma. The leading clinical features are :—

(a) Slow growth. (b) Blood-stained discharge from the nipple. (c) No involvement of lymphatic glands. (d) No secondary growths. (e) The swelling is soft, not *hard*. (f) No retraction of the nipple.

The treatment consists in performing the radical operation ; the results are very satisfactory.

What are the Features of Sarcoma ?

It occurs at any age, is elastic and mobile, and involves the tissue around, though not adherent to the chest wall nor skin; the nipple is specially prominent, enlarged, and tender. The lymphatic glands at first are free, the growth is rapid, and it often reaches a large size ; the skin is thin from stretching, and big blue veins are seen in it. The nipple sometimes exudes discoloured serum. The swelling is painless. Sarcoma may cause a rise of temperature.

Treatment by radical excision and X-ray therapy is only likely to delay the fatal outcome for some months.

DISEASES OF MUSCLES AND TENDONS.

Mention the Injuries to which Muscles are Liable ?

- (a) Contusion.
- (b) Sprain.
- (c) Rupture.
- (d) Hernia.
- (e) Wounds.
- (f) Dislocation of tendons.

Describe Sprain.

A sprain of muscle follows some unexpected exertion or unaccustomed use of a muscle and causes sudden severe

pain, and a feeling as if something had given way. There is acutely localised tenderness with pain on active use due to a tear of some of the muscle fibres.

Treatment may be by the local injection of 1% procaine and active use or by rest and strapping for a few days.

Describe Rupture.

Rupture of muscle or tendon may occur through the belly of the muscle, the junction of the belly and tendon or its attachment to bone. This injury is generally caused by a sudden forcible movement especially an involuntary one, but it may follow from other causes, *e.g.* rupture of the extensor longus pollicis following fracture of the lower end of the radius due to the wearing away of the tendon in its roughened bony canal.

The clinical features are :—

- (a) Sudden severe pain at site of the lesion.
- (b) Loss of function of the muscle involved.
- (c) Tenderness, swelling and bruising over the injury.
- (d) Palpable gap between the ends with contraction of the muscle and bulging of the muscle above its normal situation.

What is the Treatment ?

If left untreated the muscle may heal by a wide sheet of fibrous tissue. Resulting function is poor and is frequently made worse by adhesions to deeper structures. The limb may be splinted with the affected muscle relaxed to get the minimum width of scar but in early cases and if an important muscle is involved suture is advisable. It must be remembered that in some cases of rupture of the biceps brachii and the quadriceps satisfactory function follows even if no treatment is given.

Describe Muscle Hernia.

Injury to the sheath of a muscle causes part of its substance to herniate through the opening when the muscle

contracts. Apart from the swelling there are usually no symptoms and suture is seldom required.

Describe Fibrositis.

This is a disease about which little is known. It is characterised by the sudden onset of acute pain frequently in the back where it is known as lumbago following exposure to cold. If untreated or in spite of treatment it may become chronic. Some recurrent cases are undoubtedly toxic secondary to a septic focus in the teeth, tonsils or accessory sinuses. The chief areas affected are the lumbo-sacral region, the neck, intercostals and the shoulders.

Treatment of the localised type of the disease is by the local injection of an anæsthetic solution into the painful area. This gives dramatic relief and should be followed by active exercises.

Generalised cases are treated by heat, short wave diathermy and by general measures to eradicate the sepsis and relieve the pain.

Describe Myositis Ossificans.

This name is given to two conditions of entirely different etiology. *Diffuse myositis ossificans* is a progressive disease of unknown etiology in which the muscles become replaced by bone or calcified fibrous tissue. No treatment is of any value.

Myositis Ossificans Traumatica is more common and is a localised lesion which may follow repeated minor injuries or irritations or may result from too early active use following dislocations of the elbow. The first type is seen in the ossification in the adductor longus known as the "rider's bone" and the second is most commonly found in the brachialis anterior. Following dislocation of the elbow usually four to eight weeks later there is swelling and some tenderness of the soft parts in front of the joint and movements are restricted. The diagnosis is made by X-ray examination which shows a calcified mass in front of the joint. The diagnosis should be easy but the X-ray appearances must not be confused with those of neoplasm.

What is the Treatment?

Prophylaxis should prohibit active and passive movements of the elbow following dislocations (*see Part II*). Once calcification has occurred the joint should be immobilised



Fig. 32.—MYOSITIS OSSIFICANS. (After dislocation.)

for many weeks in plaster and the progress followed by X-ray examination. No attempt should be made to excise the mass until at least a year after the injury.

Describe Ischæmic Contracture.

Ischæmic or Volkmann's contracture is brought about by any interference with the vascular supply to the muscles and usually follows fractures in the vicinity of the elbow, when the joint has been acutely flexed. It is an acute interstitial

myositis resulting in sclerosis, which has for a sequel, contraction of the flexors of the forearm and hand. At first the fingers are slightly flexed, and venous congestion is noticed; the affected muscles have a stone-like hardness. The fingers may be bluish, cold, and shrivelled. Later, a claw-hand deformity often develops, and the hand may be pronated. The muscles are shrunken and wasted, and often show the reaction of degeneration. When the wrist is extended, the phalanges cannot be straightened out, but they can when the wrist is flexed first. Ischæmic neuritis of the ulnar and median nerves may rarely accompany the condition.

The pronator teres may be involved causing limitation of full supination of the forearm.

What is the Treatment?

The condition will never occur if an adequate watch is kept on all fractures in the elbow region. Any diminution in the radial pulse calls for reduction of the angle of flexion or loosening of splints until the pulse is restored to normal. If this fails multiple incisions through the deep fascia have been advised.

Once established the deformity is treated by splinting the fingers in extension with the wrist palmar flexed and gradually dorsiflexing the wrist. In severe cases or where splinting has failed the common flexor origin may be separated and a muscle slide operation carried out.

What are the Varieties of Teno-Synovitis?

- (a) Acute or suppurative.
- (b) Chronic or teno-synovitis crepitans.
- (c) Tuberculous.
- (d) Syphilitic.
- (e) Gouty.
- (f) Stenosing tendo-vaginitis.

Acute teno-synovitis is found most often in the fingers and has already been described.

Describe Teno-Synovitis Crepitans.

This lesion occurs as the result of over or unaccustomed

use of the part and is found chiefly in the extensors of the wrist, fingers and thumb, the peronei and the tendo Achilles. The synovial lining is the site of a chronic inflammatory change. The symptoms are pain on use, tenderness, possibly slight swelling of the sheath and the characteristic fine crepitation felt over the sheath on active use of the tendons.

Treatment is by rest in splints with the tendons relaxed and by diathermy or massage. If localised good results follow the injection of local anæsthetic into the sheath.

Describe Tuberculous Teno-Synovitis of the Fingers.

The flexor sheaths are most commonly involved, the bacilli reaching them either by the blood stream or by extension from a tuberculous wrist-joint or dactylitis. Hydrops is not common but melon-seed bodies are usually present; they arise from coagulated fibrin. When the ulnar bursa becomes involved ("compound palmar ganglion") the disease usually extends upwards beneath the transverse carpal ligament, and the swelling is hour-glass shaped. The finger movements are greatly impaired and flexion gradually comes on. During movement crepitations are heard.

Give the Treatment.

Treatment may be conservative or operative. Under good general measures the wrist is immobilised in plaster for at least three months and if the condition is subsiding the treatment is continued until healing occurs. Operation consists in the removal by dissection of the entire sheath, the closure of the wound followed by plaster. If conservative measures fail operation should be carried out.

Describe Stenosing Tendo-Vaginitis.

This is a localised chronic inflammatory reaction in the tendon sheath resulting in a small area of fibrosis, the contraction of which leads to constriction of the sheath and interference with the movements of the tendon. It occurs

most frequently at the radial styloid (sheath of abductor pollicis and extensor pollicis brevis) in the fingers giving rise to the condition of trigger or snapping finger and has also been described in the peronei.

What is the Treatment ?

Under local anæsthesia an incision is made into the thickened part of the sheath which is divided to expose the tendon and so ensure its free movement.

What is a Ganglion ?

A ganglion is a simple cystic swelling usually found on the back of the wrist and taking its origin from the synovial lining of tendon sheaths or joints. Its etiology is not known, it contains a semi-viscid clear substance with lubricating properties. Ganglia occur also on the flexor surfaces of the fingers. Many cause no symptoms and frequently the patient comes to see about a bone out of place (when tense they feel bony hard).

Treatment.—Accidental rupture is sometimes curative so hitting with the family bible has been advised, aspiration and injection is unwise as most ganglia communicate with the wrist joint. The ganglion should be excised using a tourniquet to ensure complete removal—even so, recurrences are not uncommon.

Describe the Diseases of Bursa.

(a) *Wounds.*—A penetrating wound is recognised by the escape of fluid and should healing not take place or suppuration occur the bursa will need to be removed. Violence may cause contusion and a collection of blood in the bursa and infection of this may occur.

(b) Inflammation.

Acute bursitis may follow wounds, punctures, or sepsis in the vicinity. The bursa becomes tense, acutely painful, and may rupture and cause infection of neighbouring structures. The bursa must be incised and drainage established.

Tuberculous and syphilitic bursitis are rare.

Chronic bursitis.—This lesion follows continuous trauma and is frequently occupational, *e.g.* housemaid's knee or pre-patillar bursitis, student's elbow or olecranon bursitis. It may affect bursæ normally present or adventitious bursæ developed over abnormal bony prominences, *e.g.* in hallux valgus. The bursa is at first distended with serous fluid and later its walls become thick and fibrous. The affected bursa should be removed.

BLOOD VESSELS AND SYMPATHETIC NERVOUS SYSTEM.

Give the Stages of the Natural Arrest of Hæmorrhage, when an Artery is completely divided.

- (a) The artery contracts transversely.
- (b) It retracts within its sheath.
- (c) The sheath collapses.
- (d) The *external* clot forms, and this causes "temporary arrest."
- (e) Formation of the *internal* clot : this :—
 - (1) Protects the external clot, and ultimately
 - (2) Organises, and thus leads to "permanent arrest" of the hæmorrhage.

N.B.—If an artery be incompletely divided, the contraction and retraction of its divided fibres only serve to *enlarge* the opening.

What are the Varieties of Injury to an Artery?

- (a) Contusion. Very frequent and a common cause of thrombosis, secondary hæmorrhage, and traumatic aneurysm.
- (b) Lateral wounds.
- (c) Perforating wounds.
- (d) Complete transverse section.

Describe an Aneurysm.

An aneurysm is a persistent dilatation of the wall of an artery. Two factors enter into its formation :—(a) disease

of the vessel wall, *e.g.* syphilis and atheroma ; (b) something which raises the intravascular tension, as severe and prolonged mechanical strains. Accordingly, aneurysms are more common in males than in females. The commonest site for surgical aneurysm is the popliteal artery. Four varieties of aneurysm are found :—(a) *diffuse* ; (b) *fusiform* ; (c) *saccular* ; and (d) *dissecting*. In the diffuse and fusiform varieties all the coats of the artery persist in an attenuated form and take part in the swelling, while in the saccular only the tunica adventitia remains. A dissecting aneurysm is one in which the middle coat has been split by the blood stream.

What are the Cardinal Symptoms of an Aneurysm ?

- (a) A pulsatile tumour, the pulsations being expansile.
- (b) Delayed pulsation in the vessel beyond the aneurysm.
- (c) Pain.
- (d) Pressure symptoms.
- (e) A systolic bruit is heard over the sac.
- (f) Arrest of pulsation by pressure on the proximal side of the aneurysm.

What are its Terminations ?

- (a) It may terminate in *death* :—
 - (1) By hæmorrhage on the surface or into one of the cavities of the body.
 - (2) By pressure on parts essential to life, *e.g.* in aneurysm of the aorta.
- (b) It may terminate in *natural cure* :—
 - (1) By gradual deposition of laminated clot.
 - (2) By accidental arrest of the blood current.
 - (3) By inflammatory action.

What Conditions may be mistaken for Aneurysm ?

- (a) Solid tumours placed over large arteries.
- (b) An abscess over a large artery.
- (c) Cysts over arteries.
- (d) Pulsating tumours of bone.

How is a Solid Tumour distinguished ?

- (a) It is movable in *the course* of the artery, and may be separated from the artery.
- (b) It neither collapses nor is compressible when the artery is compressed on the proximal side.
- (c) Bruit and thrill are usually absent.

How is an Abscess or a Cyst distinguished ?

Much in the same way as a solid tumour ; there will also be a history that it began as an inflammatory swelling, and that this gradually softened in the centre. *Cysts* are more sharply defined than abscesses, are of a globular-shape, and are more movable than an abscess.

What tests should be performed before operation of ligation is performed ?

- (a) Delbet's test. If the peripheral pulses are absent and the distal temperature and nutrition are good the collateral circulation is adequate.
- (b) Compress the artery above the aneurysm. If (1) colour remains good, (2) oscillometer reveals pulsation it is safe to operate.
- (c) If still in doubt operate and apply a Matas or Halstead aluminium band. Keep careful watch and slacken if circulation is in doubt.

Mention the Chief Surgical Methods of Treatment.

- (a) Excision of the aneurysm.
- (b) Ligation of the artery :—
 - (1) Proximally at a distance. (Hunter.)
 - (2) Distally at a distance. (Brasdor.)
 - (3) Just above the sac. (Anel.)
 - (4) Branches distally. (Wardrop.)
 - (5) Above and below the aneurysm at the same time opening the sac and removing the clot. (Antyllus.)
- (c) Needling to promote thrombosis by irritating the wall of the aneurysm. (Macewen.)

- (d) Insertion of coil of silver wire through insulated needle into the aneurysm and use it as the anode for electrolysis thus causing thrombosis. (Moore-Corradi.)
- (e) Endo-aneurysmorrhaphy. (Matas' operation.)
- (f) Application of Matas or Halstead aluminium band proximal to the aneurysm.

Describe Aneurysm of the Subclavian Artery.

This is more common in males than in females ; is usually on the right side and almost always affects the third part of the artery. Dock workers and coal-heavers are especially liable to it. The chief clinical features are :—

- (a) A pulsating swelling immediately above the clavicle external to the sterno-mastoid.
- (b) Delay in the radial pulse.
- (c) Cough and hiccough from irritation of the phrenic nerve as the aneurysm progresses.
- (d) Irritation followed by pressure upon the lower trunk of the brachial plexus.
- (e) Boring pains from erosion of the clavicle or first rib.
- (f) Œdema in late stages from pressure upon the sub-clavian vein.

Subclavian aneurysm must be distinguished from cervical rib.

Describe Aneurysm of the Common Carotid and its Symptoms.

This is the commonest surgical aneurysm found in females. Either the origin or the termination of the artery may be affected. In the lower part of the neck the swelling appears beneath the sterno-mastoid ; in the upper part, internal to that muscle. In both cases the pulse in the superficial temporal artery is delayed.

Symptoms arise from pressure upon the :—

- (a) Internal jugular vein.
- (b) Trachea or larynx.
- (c) Œsophagus (in lower carotid aneurysm).
- (d) Bodies of the cervical vertebræ.

- (e) Vagus and sympathetic nerves.
- (f) Recurrent laryngeal (in lower aneurysm).
- (g) Superior laryngeal (in higher aneurysm).
- (h) Hypoglossal (in higher aneurysm).

Aneurysm of the upper part of the common carotid may be simulated by a tumour of the carotid body.

Describe Popliteal Aneurysm.

The popliteal artery is the commonest site for surgical aneurysm because (a) the artery is unsupported behind ; (b) it is the termination of a long arterial column ; (c) the artery forks into two equal branches ; and (d) the artery is subjected to repeated slight traumata. Popliteal aneurysm must be distinguished from a pulsating sarcoma of the lower end of the femur. Symptoms arise from pressure upon the lateral and medial popliteal nerves, and the popliteal vein.

Describe Traumatic Aneurysms and their Treatment.

These follow punctured wounds of an artery from fire-arms, pieces of glass, fractured bones, etc. There are two main classes—(a) primary diffuse ; and (b) circumscribed. The former is a diffuse hæmatoma, which may or may not possess a bruit. The latter variety occurs several weeks after the wound, when the surrounding tissues have been consolidated to form a sac. It is localised, small, hard, and has a bruit.

The treatment of a primary traumatic aneurysm consists in (a) preliminary compression of the artery at some distance from the wound ; (b) freely laying open the swelling ; (c) searching for the wounded vessel ; (d) ligature below and above the perforation ; and (e) cross section of all that remains of the wounded artery. To treat the circumscribed form, the aneurysm should be dissected out, after ligating the artery above and below the injury.

Describe Hæmangiomata.

Three varieties of hæmangiomata occur, namely, capillary, compact, and cavernous ; the latter are most commonly

found in viscera, especially the kidneys and liver. The first variety are known as nævi. A nævus consists of dilated capillaries, arterioles, and venules united by connective tissue.

Nævi are classified as :—

- (a) Cutaneous or “ Port wine stain.”
- (b) Subcutaneous.
- (c) Mixed, that is, partly in the skin and partly in the subcutaneous tissues.

Hæmangiomata are the most common tumours found in children. They take origin from embryonic “ rests.”

All nævi tend to a natural cure, and therefore, it is best to have patience. In about 50 per cent. of cases the tumours disappear of their own accord. They usually either enlarge or shrink at the first dentition, the second dentition, or at puberty. Localised tumours may be treated by CO₂ snow or by diathermy. Larger ones on exposed areas may be treated by radium but scarring is liable to result.

Describe Raynaud's Disease.

Raynaud's disease is a spasmodic contraction of the arterioles due to some nervous affection. It mainly affects the fingers and toes. The condition is commoner in females, usually commences about the age of twenty, and is bilateral. The mildest type of the disease is one in which the patient suffers from vaso-motor spasms. These spasms most frequently occur in winter, and may be followed by hæmoglobinuria. During the attack, the affected parts become cold, dead-white in colour, and extremely painful—the “ local syncope ” stage. It is followed, after a longer or shorter period, by excessive dilatation of the blood vessels, so that the part becomes dark in appearance—the “ local asphyxia ” stage. Superficial gangrene of a dry type may arise as a sequel.

Describe Thrombo-Angitis Obliterans.

The disease occurs almost exclusively in males of 25 to 50 years of age. The disease involves the larger vessels,

e.g. the dorsalis pedis or tibial arteries and as the smaller ones are not involved a collateral circulation will develop. The arterial wall is thickened and the lumen is diminished. The intima becomes thickened and thrombosis occurs. The fibrosis extends beyond the vessel and fuses artery, vein and nerve together. The thrombi may become organised and recanalised. The symptoms are those of circulatory insufficiency (*vide infra*) plus those of thrombo-phlebitis migrans. The lower limbs are most frequently affected.

It is almost certain that smoking is a predisposing factor.

Describe Arteriosclerosis.

Arteriosclerosis occurs in older people than thrombo-angiitis and it affects the main vessels as well as the smaller arteries. The outer and middle coats lose their elasticity and become fibrosed. Owing to the smaller vessels being involved a collateral circulation is slow to develop and is usually inadequate. The arterial wall may become calcified and may show on X-ray examination.

The symptoms are those of circulatory insufficiency and the lower limb is almost invariably affected although the coronary and cerebral arteries may also be involved.

What are the Symptoms of Obliterative Vascular Disease?

The symptoms of circulatory insufficiency are :—

- (a) Burning pain in the foot.
- (b) Numbness on exertion.
- (c) Loss of sweating.
- (d) Intermittent claudication—pain in the calf muscles coming on after walking a certain distance relieved by rest only to occur again. Comes on more quickly uphill or on walking quickly.
- (e) Colour changes. Pallor. Coldness. Nails grow less rapidly and become brittle.
- (f) Nocturnal pain relieved by hanging the limb over the side of the bed.

How would you Examine a case with Vascular Symptoms?

- (a) Careful history.
- (b) Note colour changes. Examine the nails. Feel peripheral pulses.
- (c) Estimate pulsation by oscillometer.
- (d) Clinical tests such as the venous filling time, or reactive hyperæmia test.
- (e) Skin temperature estimation after half an hour in a warm room with the limbs exposed. The temperature is taken before and after sympathetic tone has been inhibited.
- (f) Arteriography.

What Methods are Employed to Inhibit Vasomotor (Sympathetic) Tonus?

- (a) Spinal anæsthesia.
- (b) Typhoid vaccine—take mouth and skin temperature before and after and calculate vasomotor index which

$$= \frac{\text{skin rise} - \text{mouth rise}}{\text{mouth rise}}$$
 If greater than 1.5 sympathectomy likely to be successful. An unpleasant method which should not now be used.
- (c) Local nerve block, *e.g.* posterior tibial, median or ulnar nerves.
- (d) Warming the body. (Lewis.)
- (e) Warming the other limbs. (Landis and Gibbon.)
- (f) Paravertebral novocaine block.

Describe the Treatment of Vasopastic Phenomena.

Spasmodic vascular diseases, *e.g.* Raynaud's disease, erythrocyanosis, etc., may be treated by sympathectomy. It should be remembered that warm loose clothing and avoiding exposure to cold are often of great benefit.

Describe the Treatment of Obstructive Vascular Diseases of the Limbs.

Should there be a significant degree of vasospasm associated with the obstruction sympathectomy should be carried out,

Other methods of treatment are :—

- (a) Stop smoking in all cases.
- (b) Intravenous saline 300 c.c. three times weekly.
- (c) Passive vascular exercises by means of suction and pressure in cycles with the limb enclosed in a special boot.
- (d) Intermittent venous occlusion.
- (e) Careful attention to toilet of toes and nails and avoid trauma.
- (f) Arterectomy, *i.e.* excision of a localised obstruction.

If gangrene occurs small areas may be treated by one of the methods above, but larger areas will call for amputation. Gangrene is described on page 30.

Describe Embolism.

Emboli in the vessels of the limbs are usually derived from the heart or aorta and they lodge most frequently at the bifurcation of an artery. The outlook is more serious in the lower limb. The most frequent site is the common femoral and then the common iliac artery. When the embolus lodges secondary thrombosis begins and the increase in size of the embolus leads to the blocking of the collateral circulation and gangrene.

The symptoms are sudden pain, coldness, and numbness of the limb. Anæmia or pallor with blotchy cyanosis and incomplete loss of sensation with loss of motor power complete the picture. Gangrene develops and its extent depends on the collateral circulation.

What is the Treatment ?

Embolectomy is performed in early cases not after 24 hours. May be brilliantly successful or thrombosis of the vessel may follow the incision into the artery.

Paravertebral block or *sympathectomy* will abolish the severe spasm and allow the collateral circulation to open up.

Arterectomy is of value in some cases.

Too often the case is seen when amputation is the only possible treatment.

Mention some of the Indications for Sympathectomy

| | | |
|---|---|---|
| <i>Cervico dorsal sympathectomy</i> | { | Raynaud's disease of upper limb. |
| | | Unilateral sweating. |
| | | Retinitis pigmentosa. |
| | | Angina pectoris. |
| | | Scleroderma. |
| <i>Lumbar ganglionectomy</i> | { | It has also been suggested for bronchial asthma, trigeminal neuralgia and migraine. |
| | | Raynaud's disease of lower limb. |
| | | Thrombo-angitis obliterans. |
| | | Poliomyelitis with trophic changes. |
| | | Hirschsprung's disease in boys (left side). |
| <i>Pre-sacral neurectomy</i> | { | Dysmenorrhœa. |
| | | Amenorrhœa. |
| | | Cord bladder. |
| | | Bladder in spina bifida. |
| | | Megacolon (plus inferior mesenteric neurectomy in girls). |

Describe Varicose Veins.

A varicose vein is one which has become dilated, thickened and tortuous. The disease occurs in both sexes and affects sedentary workers and athletes alike. The wall of the vein becomes fibrosed and the valves become incompetent. The veins affected are the superficial ones of the lower limbs—great and lesser saphenous veins.

The obstruction to the venous return leads to congestion, the deposition of blood pigment, varicose dermatitis and ultimately ulceration usually in the lower third of the medial surface of the leg.

What is the Treatment?

If Trendelenbury's test is positive—empty the veins by elevation, compress great saphenous at saphenous opening and make patient stand. If the veins fill from above

when the compression is released the test is positive. The treatment is by ligation ; single or multiple, and injection.

Less severe cases are treated by injection therapy. The solutions used are quinine urethane, sodium morrhuate and sodium salicylate.

Varicose ulceration is treated by correcting the œdema and venous congestion by the application of even pressure by elastoplast bandages. The bandage is changed when loose and each time it is changed injections are given. When there is no further decrease in the size of the limb a supporting bandage such as Unna's paste or viscopaste may be used and support will in many cases have to be continued permanently to prevent recurrence.

Distinguish between Infusion and Transfusion.

Transfusion is the term employed to describe the giving of whole blood or one of its modifications intravenously. The modifications may be plasma, serum or dried plasma, and the blood may be citrated, defibrinated or heparinised.

Infusion is the intravenous administration of fluids other than blood. The fluids used are normal or hypertonic saline, glucose saline and gum saline. In addition drugs such as salvarsan are given intravenously and this route is employed also for the giving of anæsthetics such as pentothal sodium and evipan.

What are the Indications for Transfusion ?

- (a) *Hæmorrhage*—blood.
- (b) *Shock*—plasma.
- (c) *Suppression of urine*—transfusion or infusion.
- (d) *Dehydration*—infusion.
- (e) *Hæmorrhagic diseases*—to counteract deficiency in the blood and replace blood lost.
- (f) *Toxæmias and infections*.
- (g) *Anæmia*—both primary and secondary.

What are the Dangers of Blood Transfusion ?

Incompatibility is shown by restlessness, fullness in the head, choking feeling, flushed face and pain in the lumbar region from the excretion of hæmoglobin by the kidney.

Cardiac embarrassment is shown by irregular rapid pulse and laboured breathing.

Transmission of disease.—Malaria and syphilis may be transmitted to the recipient.

Explain Incompatibility.

Incompatibility is due to the giving of blood the corpuscles of which are agglutinated and hæmolysed by the serum of the recipient. It has been discovered that human blood falls into four main groups.

Human red corpuscles may contain *agglutinogens* which are known as A and B. The corpuscles have been shown to contain A alone, B alone, A B or no agglutinin, *i.e.* O.

Human serum contains in the same way agglutinins known as *a* and *b* and four types of serum occur *a*, *b*, *ab*, *o*. As corpuscles of type A are agglutinated by *a* and B by *b* there must be four groups of blood composed as in the table below :—

| <i>Corpuscles</i> | <i>Serum</i> | <i>Moss type</i> | <i>International type</i> |
|-------------------|--------------|------------------|---------------------------|
| A B | <i>o</i> | 1 | A B |
| A | <i>b</i> | 2 | A |
| B | <i>a</i> | 3 | B |
| O | <i>a b</i> | 4 | O |

As group 4 or O people have no agglutinogens in their corpuscles they may give blood to anyone and are called *universal donors* and similarly as group A B has no agglutinins in the serum such people are *universal recipients*.

How would you Type Blood for Transfusion ?

Two methods are employed, the *direct* and the *indirect*. A direct test is done by mixing the serum of the recipient with

a suspension of the prospective donor's corpuscles. If agglutination occurs the bloods are incompatible. This method does not determine to which group either belongs.

The indirect method matches the corpuscles of the donor and recipient against known sera of Groups 2 and 3. The following table gives the results with corpuscles of each group. + means agglutination, - means no agglutination. This is the method used for typing donors for the transfusion services.

| <i>Group 2 Serum</i> | <i>Group 3 Serum</i> | <i>Corpuscles belong to group</i> |
|--------------------------|--------------------------|---------------------------------------|
| - | - | 4 or O |
| + | - | 3 or B |
| - | + | 2 or A |
| + | + | 1 or A B |

What Methods of Transfusion are Employed ?

Direct methods are not now employed and the simple citrate method is used most frequently for transfusion of both fresh and stored blood. The transfusion may be given fairly quickly or by the continuous drip method. A description of the technique of the various methods of withdrawing and giving blood is outside the scope of this book.

CATECHISM SERIES

SURGERY

PART V

FIFTH EDITION

REVISED AND REWRITTEN

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SURGERY

PART V

THE SCALP.

What are the sites of Hæmorrhage into the Scalp Tissues ?

(a) Superficial to the occipito-frontalis=*Simple Contusion*—blood confined to injured area.

(b) In the *sub-aponeurotic* layer=*Hæmatoma*—blood diffused over whole area of scalp.

(c) Beneath the pericranium=*Cephalhæmatoma*—blood confined to area of one bone.

Cephalhæmatomata most frequently occur during birth.

Do not mistake a hæmatoma for a depressed fracture of the skull.

What are the Special Risks of Scalp Wounds ?

(a) Profuse hæmorrhage.

(b) If the sub-aponeurotic layer ("the dangerous area") be opened into, sepsis may spread along the emissary and diploic veins, and bring about cerebral complications, meningitis, or sinus thrombosis.

(c) Osteomyelitis of the skull bones, which may lead to necrosis, especially of the outer table.

(d) Erysipelas.

What are the Chief Tumours of the Scalp ?

(a) Sebaceous Adenomata.

(b) Wens or sebaceous cysts.

(c) Dermoids.

(d) Lipomata.

(e) Nævi.

Mention the Distinguishing Features of these Tumours.

(a) SEBACEOUS ADENOMATA. — Frequently multiple ; purple appearance and covered with glistening skin. They often fungate. They should be excised.

(b) WENS:—Usually multiple ; are fixed to the skin in the centre, but move freely over the deeper structures. The cyst should be completely removed.

(c) DERMOID CYSTS differ from wens in that they are beneath the occipito-frontalis, and are fixed to the deeper structures (pericranium). There is usually a depression in the bone around the base, and the skin is freely movable over it. The walls are thin ; the contents are hair, epithelial debris, and pultaceous material.

(d) A LIPOMA lies in the subcutaneous tissue ; is freely movable over the deeper structures ; is not fixed to the skin except by fragile tags of fibrous tissue ; is lobulated, and the manner in which the rounded edge slips from under the finger should be sufficient to distinguish it.

(e) A SUBCUTANEOUS NÆVUS is reducible on pressure, without causing any cerebral symptoms, and the bone is felt entire below. Be very careful in cases where a nævus is placed over a fontanelle or situated at the root of the nose. A nævus increases in size and tension when the child cries or strains.

THE CRANIUM.

Distinguish between Concussion, Cerebral Contusion, Irritation and Compression.

Concussion is the term given to a condition of unknown pathology which results in immediate unconsciousness following an injury to the brain. Should death occur there may be no feature other than multiple petechial hæmorrhages. The unconsciousness may be momentary but if it is severe or prolonged a more serious brain injury is probable.

Cerebral Contusion is the term applied when the injury has resulted in structural damage to the brain. Such a trauma may occur at the site of the blow or at a point diametrically opposite to it (*contre coup*).

Compression is the name given to pressure on the brain and it may be due to blood, pus, and tumours. Owing to the rigid walls of the skull any collection of blood or any other space occupying lesion must result in compression of the contents of the cranium.

Cerebral Irritation is the name given to a state of hyper-irritability of the brain which follows recovery from concussion. The pathology is unknown. Usually after severe concussion the patient lies curled up and resents being touched in any way. He is usually conscious, but confused and the pulse is slow and cerebral in type.

Give the Clinical Features of Concussion.

A. CONSCIOUSNESS.—Immediately after the injury the patient becomes unconscious. He can, however, be partially aroused by the application of a strong stimulus.

B. PULSE.—Small, slow, and often irregular.

C. RESPIRATIONS.—Slow, shallow, and sighing.

D. SKIN.—Cold, pale and clammy.

E. PUPILS.—Semi-dilated, and react sluggishly to light.

F. TEMPERATURE.—Sub-normal.

G. MUSCULAR SYSTEM.—Absence of voluntary movement; the muscles are flaccid.

After a varying interval of time the patient vomits, and the period of reaction comes on.

(a) Elevated temperature.

(b) Fast, bounding pulse.

(c) Pain in the head.

(d) Flushed features.

Describe the Treatment.

The treatment is essentially expectant. The patient is placed flat in bed and the head and scalp are examined for signs of wounds or fracture. At the same time a rapid neurological examination is carried out and in uncomplicated cases is negative. An hourly or even half hourly pulse is recorded in order that the first sign of compression may be noted. If consciousness is not rapidly regained and there is no incontinence a catheter is passed. A rapid examination

of the limbs, spine, neck, abdomen and thorax is carried out to exclude injuries of other systems.

After return to consciousness the patient is kept with the head low and all excitement is avoided. The return to work and activity must be slow and bed for three weeks should be insisted on except in mild cases.

What are the Clinical Features of Cerebral Contusion ?

The clinical features are those of concussion but of greater severity. Consciousness is lost for a longer period and there may be localising signs according to the area affected. The temperature is usually raised but the main features are those of irritation due to the resulting cerebral œdema.

Treatment aims at relieving the increased pressure and this may be done by giving magnesium sulphate by mouth or per rectum, by the intravenous injection of hypertonic saline or glucose or by careful and cautious lumbar puncture.

Give the Clinical Features of Compression.

A. CONSCIOUSNESS.—There may or may not be an interval between concussion and compression. When compression is present, the patient is completely unconscious.

B. PULSE.—Slow and strong.

C. RESPIRATIONS.—Slow and stertorous.

D. SKIN.—Flushed.

E. PUPILS.—Pupil on the side of the lesion is at first contracted, then fully dilated. The pupil on the uninjured side is semi-dilated.

F. TEMPERATURE.—101° or 102° F. Sometimes cerebral hyperpyrexia is present.

G. MUSCULAR SYSTEM.—Signs of irritation are first present, then subsequently signs of paralysis. Clonic jerkings of the muscles involved occur, this is termed unilateral monospasm ; later paralysis is called monoplegia. Retention of urine and fæces occurs.

Mention the Sources of Intra-cranial Hæmorrhage.

(a) Meningeal vessels, especially the middle meningeal—the blood collects between the dura-mater and the inner table of the cranium.

(b) Cerebral vessels, most commonly the middle cerebral. The blood either presses upon the cerebral cortex, or pours into the lateral ventricles.

(c) Venous sinuses.

Give the Clinical Features of Meningeal Hæmorrhage.

- (a) Concussion.
- (b) Return of consciousness.
- (c) Signs of irritation.
- (d) Return of unconsciousness.
- (e) Full pulse becoming progressively slowed.
- (f) Progressive rise in blood pressure.
- (g) Respirations at first slow and deep, later shallow.
- (h) The pupil shows the following changes :—

| <i>Pupil on side of lesion.</i> | <i>Opposite pupil.</i> |
|---------------------------------------|-----------------------------------|
| (i) Contracted and reaction sluggish. | Normal. |
| (ii) Slightly dilated, no reaction. | Contracted and reaction sluggish. |
| (iii) Dilated and fixed. | Slightly dilated, no reaction. |
| (iv) Do. | Dilated and fixed. |

(i) The muscles show the following stages :—(i) irritation of the muscles on the opposite side to the lesion, (ii) paralysis of muscles on opposite side and irritation of those on the side of the lesion, (iii) paralysis on both sides.

The lesion must be diagnosed before the late stages for treatment to be successful and this consists in craniotomy, removal of clot and control of the hæmorrhage.

Describe Intra-cranial Hæmorrhage of the Newly Born.

Occasionally in first-born children, usually of the male sex, a hæmorrhagic extravasation occurs in the sub-arachnoid space of the vertex. The blood is probably derived from two sources (a) rupture of small venules owing to partial asphyxia, and (b) tearing of the minute tributaries

of the superior sagittal (longitudinal) sinus due to the traction of the overlapping parietal bones.

Fractures of the skull are described in Part II.

What Important Point is it necessary to determine in Congenital Tumours of the Cranium?

Whether or not it communicates with the cavity of the cranium. The signs of such communication are :—

- (a) The cyst is fixed to the bone.
- (b) There is an opening in the bone.
- (c) Swelling is reducible wholly or in part.
- (d) Pulsation—probably cardiac and respiratory—is noticed.
- (e) On reduction there may be cerebral symptoms—convulsions, paralysis, etc.
- (f) The tension and size increase when the child cries, or during strong respiratory efforts.

Classify Cephaloceles.

| | | |
|--------------|---|---|
| CEPHALOCELES | { | Occipital { Superior, <i>i.e.</i> above the inion. Inferior, <i>i.e.</i> below the inion. Sincipital, <i>i.e.</i> frontal. Lateral—in region of pterion or asterion : they are very rare. |
|--------------|---|---|

Describe the Varieties.

(a) MENINGOCELE, where the protrusion consists of a part of the membranes filled with cerebro-spinal fluid. It is usually small in size, globular, pedunculated or sessile, fluctuating, and translucent. Its tension is increased by strong expiration, and it may be entirely reduced.

(b) ENCEPHALOCELE, where the protrusion consists of brain as well as membranes. It does not fluctuate, is opaque, but pulsates along with the rest of the brain, and may be partly reducible. Usually found in frontal region.

(c) HYDREN-CEPHALOCELE, where the protruded brain is distended by an accumulation of fluid within the ventricles ; it is often large, fluctuates, and may sometimes pulsate.

Describe Cephalhydrocele.

Occasionally a small cystic swelling is found beneath the pericranium resulting from a simple fracture of the vault of the skull.

The signs indicative of such a swelling are :—

- (a) It can be partially reduced by pressure.
- (b) Its pulsation synchronises with that of the heart.
- (c) It becomes tense on straining or exertion.
- (d) After partial reduction it is sometimes possible to palpate a gap in the cranium through which the cerebro-spinal fluid has escaped.

What is a Cephalhæmatoma ?

This is a subpericranial hæmorrhage usually affecting the parietal region. Occasionally it is bilateral. The condition is noticed two or three days after birth ; it rapidly increases in size and resembles a cystic tumour. During birth a temporary indentation of the parietal has occurred, the bone being forcibly separated from the vascular pericranium. When the child cries the hæmorrhage increases in amount.

Apply pressure under a bandage to the swelling, until it is absorbed. Some surgeons open it up after two weeks and remove the blood clot.

PYOGENIC DISEASES OF THE BRAIN AND MENINGES.*Describe Pachymeningitis.*

Surgically there are two forms of inflammation of the dura mater, serous and suppurative, the latter generally terminating by the formation of an extra-dural abscess. Pachymeningitis most commonly follows chronic otitis media, empyema of the frontal sinuses and septic compound fractures of the skull.

What are the Clinical Features of Extra-Dural Abscess ?

- (a) Rigors, elevated temperature and rapid pulse.
- (b) Severe headache with marked tenderness over the site of the abscess.

- (c) Localised œdema of the scalp over an area corresponding to that of the abscess—Pott's puffy tumour.

The treatment of extra-dural abscess is that of the primary focus with, in addition, the exposure of the abscess, the removal of all diseased bone, and the provision of thorough drainage.

Describe Leptomeningitis.

The name given to inflammation of the arachnoid and pia mater. It may be pyogenic, tuberculous or diplococcal (epidemic cerebro-spinal meningitis). Pyogenic meningitis is either diffuse or localised when it forms a sub-dural abscess. The other types will not be described.

What are the Clinical Features ?

- (a) Violent headache in the frontal or temporal region.
- (b) Elevated temperature and rapid pulse.
- (c) Cephalic cry.
- (d) Cerebral vomiting, *i.e.* without nausea, and independent of the taking of food.
- (e) Increased cerebro-spinal fluid pressure, turbid fluid containing pyogenic organisms.
- (f) When the meningitis affects the base of the brain there will be marked head retraction and usually squinting.

What is the Treatment ?

- (a) Deal with the cause.
- (b) Lumbar puncture to relieve pressure and to identify the causal organism.
- (c) Sulphanilamide, sulphapyridine, or sulphathiazole in full doses depending on the predominant organism.

The prognosis is grave, but with the advent of chemotherapy is no longer hopeless.

Describe Cerebral Abscess.

Cerebral abscess may be acute or chronic. It arises from a primary focus elsewhere either by direct spread, *e.g.* middle ear or by the blood stream, *e.g.* from pulmonary abscesses or bronchiectasis.

The common types are temporo-sphenoidal and cerebellar.

Describe Temporo-Sphenoidal Abscess.

A single abscess usually results from chronic otitis media and occurs in the temporal lobes. Macewen describes three stages :—(a) the initial stage ; (b) the fully formed abscess ; and (c) terminal stage.

Initial stage.—The discharge from the ear ceases, there is severe pain in the temporal region, followed by a rigor, increased pulse rate and gastro-intestinal derangement. Cerebral vomiting is common. This stage rarely lasts more than 16 hours.

Second stage.—The features resemble those of narcotic poisoning. Cerebration is slowed and the patient is languid and easily tired. The pain in the temporal region is diminished but the affected side of the head is tender on percussion. The temperature is subnormal and pulse and respirations are slow. Localised paralyses are found. Papillœdema is misleading as it is inconstant, but is more marked on the side of the lesion.

The terminal stage.—The abscess terminates in one of three ways :—

- (a) by causing diffuse leptomeningitis ;
- (b) by bursting into one of the ventricles ;
- (c) by its mechanical effects.

The abscess may press upon the motor area the internal capsule, the motor centre for speech (lower parts of pre-central and inferior frontal gyri on the left side), the superior temporal gyrus, the middle part of the inferior parietal lobule (angular gyrus), or the occipital lobe.

Remember that the order of the centres in the motor area of the cortex is *leg, arm, face* from above downwards, and accordingly if the paralysis occurs in the order face, arm, leg, then the abscess is pressing on the cortex. In the internal capsule the arrangement is *leg, arm, face* from without in,

and therefore, when pus collects in the vicinity of the internal capsule, paralyses occur in that order.

Describe Cerebellar Abscess.

Cerebellar abscess is usually secondary to septic phlebitis of the transverse (lateral) sinus, the result of chronic otitis media. The chief signs and symptoms are :—

- (a) Vertigo and cerebellar ataxia.
- (b) Pulse slow, temperature subnormal, respiration slow, and often Cheyne-Stoke's breathing.
- (c) Speech slow and syllabic.
- (d) Retraction of head and neck. Vomiting.
- (e) Lateral nystagmus, optic neuritis.

What is the Treatment of Cerebral Abscess ?

The abscess must be drained. In some cases it may be possible to remove an encapsulated abscess, in others aspiration may be the only possible treatment. The exposure of temporal and cerebellar abscesses is described in *Operative Surgery Catechism*.

Describe Transverse Sinus Thrombosis.

Septic inflammation of the transverse (lateral) sinus is almost always a sequel of chronic middle ear and mastoid infection. The cardinal signs are :—

- (a) Cessation of the aural discharge.
- (b) Severe headache, tenderness over the mastoid and occipital regions.
- (c) Rigors and swinging temperature.
- (d) Cerebral vomiting.
- (e) Thrombosis of the internal jugular vein ; it may be palpated in the neck as a hard and tender cord.
- (f) Pyæmic abscesses.
- (g) Paralysis of the ninth, tenth, or eleventh cranial nerves.

What is the Treatment ?

In addition to the treatment of the middle ear disease the jugular vein is ligated and the sinus is opened, cleansed and packed. Chemotherapy is of great value.

Describe Cavernous Sinus Thrombosis.

Infection of this sinus follows a primary focus in the orbit or in the "dangerous" area of the face drained by the angular vein. Infection may pass to the opposite sinus along the inter-cavernous sinuses. The patient is acutely ill from septic toxæmia and suffers severe pain. The eye is blind and is proptosed and there is gross swelling of the eyelids. There is usually paralysis of the third, fourth and sixth cranial nerves.

The condition is usually fatal. Care should always be taken even with trivial septic lesions in the "catchment area" of the sinus. Surgical treatment of the established condition is impracticable. Chemotherapy should be tried.

INTRA-CRANIAL TUMOURS.*Classify Intra-cranial Tumours.*

It is customary to include all lesions which encroach on the cranial cavity under the clinical classification of "tumours."

The types most frequently found are :—

- (a) *The Gliomata*.—The most common tumour is derived from the neuroglia. Vary from the simple astrocytoma to the extremely malignant medulloblastoma. Type of tumour cannot be diagnosed clinically.
- (b) *Pituitary Tumours*.
- (c) *Meningiomata*.—Simple tumours arising from the meninges.
- (d) *Neuro-fibromata*.—Often found in the cerebello-pontine angle growing from the eighth nerve.
- (e) *Granulomata*.—Gummata and tuberculomata both occur.
- (f) *Carcinomata*.—Secondary tumours in the brain follow carcinomata of the breast and thyroid; hypernephroma also occurs.
- (g) *Blood-vessel tumours*.—Angiomata.
- (h) *Cysts*.

Give the Clinical Features of Intra-cranial Tumours.

- (a) Headache—due to irritation of the branches of the trigeminal nerve supplying the meninges.
- (b) Cerebral vomiting.
- (c) Tenderness over the site of the tumour ; this sign is only found in cortical tumours.
- (d) Double optic neuritis.
- (e) Giddiness often occurs, due to the diminished blood tension owing to the lessened vascular supply to the cortex.
- (f) Mental failure ; frequently.
- (g) Local symptoms may be present, attacks of Jacksonian epilepsy when the motor area is involved ; various forms of aphasia ; astereognosis, *i.e.* inability to recognise the shape and size of an object when the eyes are shut. Astereognosis indicates the presence of a tumour of the parietal lobe of the opposite side.

What are the Special Features of Tumours in the Occipital Lobe ?

Tumours involving the occipital lobe lead to homonymous hemianopia, *i.e.* blindness in the temporal half of the retina on the same side of the lesion and in the nasal half of the opposite side.

The optic nerves become atrophied and the patient loses his sight. Coma gradually ensues, and death occurs. A rapidly-growing small tumour causes the patient more distress than a slowly-growing large tumour.

Describe Cerebellar Tumours.

Cerebellar tumours may be situated either in (a) the vermis ; (b) a lateral lobe ; or (c) the cerebello-pontine angle. In all cases, headache, cerebral vomiting, double optic neuritis, and ataxia are found. When the tumour is intra-cerebellar there is a conjugate deviation of the eyes to the side opposite to that of the tumour, with well-marked lateral nystagmus. The main differences between intra-

cerebellar and extra-cerebellar (cerebello-pontine) tumours are indicated in the following table :—

| | INTRA- CEREBELLAR TUMOURS. | EXTRA- CEREBELLAR TUMOURS. |
|--|--|---|
| Optic neuritis . | An early and well-marked feature. | Variable in time of onset and intensity. |
| Conjugate deviation and lateral nystagmus. | Present. | Usually absent. |
| Vertigo . | Patient falls <i>away</i> from the side of the tumour. | Patient falls towards the side of the tumour. |
| Tendon reflexes . | Variable — often diminished. | Increased—on the opposite side. |
| Skin reflexes . | Normal. | Lessened on the opposite side. |
| Pressure on cranial nerves— | | |
| 5th . | Rarely. | Frequently. |
| 7th . | Nil. | Marked pressure. |
| 8th . | Slight deafness on the affected side. | Marked deafness; on the affected; side. |

Describe Pituitary Tumours.

The common tumours are adenomata of the anterior lobe which are named chromophobe, chromophil, or mixed tumours, according to the type of cell. In addition suprasellar cysts and tumours arise from Rathke's pouch (the remains of the pharyngeal diverticulum from which the anterior lobe is developed). Chromophobe adenomata cause hypopituitarism whereas chromophil tumours result in hyperpituitarism. The mixed tumours cause mixed hypo and hyper pituitarism.

Adenomata enlarge the sella turcica downwards and forwards whereas suprasellar tumours erode the clinoid processes.

In addition to the features described above pituitary tumours cause the features of cerebral tumour and also impairment of vision with the appearance of a haze over everything leading eventually to bitemporal hemianopia.

What special methods are employed in the Diagnosis of Intra-cranial Tumours ?

After careful neurological examination the site and diagnosis may remain in doubt. Additional methods are :—

- (a) X-ray. May show erosion or hyperostosis or calcification in the tumour.
- (b) Ventriculography. This reveals deformity or displacement of any part of the ventricular system.
- (c) Arteriography is of value in the diagnosis of angioma or intra-cranial aneurism.
- (d) Encephalography has been introduced recently and may prove of great value in localising tumours.

It is always advisable to have the Wassermann reaction done, but no accurate pathological diagnosis is possible in many cases before operation.

What is the Treatment of Cerebral Tumour ?

Operative removal is possible in a considerable number of cases of pituitary and acoustic tumours. Cerebellar tumours and meningiomata may also be excised. If the tumour is inoperable decompression will relieve the symptoms.

Describe Hydrocephalus.

Hydrocephalus may be congenital or acquired. The congenital type may be present at birth and continues to increase and the characteristic appearance of the huge cranium and small face is produced. The bone is thinned and the sutures widened and the pressure causes atrophy of the cortex.

In the acquired forms the head cannot enlarge so much and the pressure symptoms are more severe.

Chronic internal hydrocephalus may arise (a) from

obstruction to either the aqueduct of Sylvius or the foramen of Magendie ; or (b) from failure of absorption of cerebro-spinal fluid in the subarachnoid space. The former variety is termed obstructive, and the latter communicating. Obstructive hydrocephalus may be caused by the presence of a tumour or from adhesions following basal meningitis, while the communicating type is always secondary to adhesions.

The nature of the hydrocephalus is determined by ventriculography and the treatment depends on the cause. Some good results have followed operative treatment.

THE FACE AND MOUTH.

Describe the Development of the Face.

The primitive mouth or stomodæum is bounded above by the *fronto-nasal process*, below by the *mandibular arches*, laterally by the mandibular and *maxillary processes* and is separated from the foregut by the bucco-pharyngeal membrane. The *olfactory pits* develop on the free margin of the fronto-nasal process and enlarge backwards, dividing the fronto-nasal process into a *median nasal process* and two *lateral nasal processes*. The angles of the median nasal process enlarge and are called the *globular processes*.

The processes fuse so that :—

- (a) The median nasal process forms the nasal septum, premaxilla and middle third of upper lip.
- (b) The lateral nasal processes form the roof and lateral walls of the nose.
- (c) Maxillary processes form the cheek and remainder of the upper lip. The *palatal processes* grow medially from them to unite with the nasal septum and form the palate.

Describe Harelip.

This congenital malformation may be median or lateral. The median variety is very rare and is due to a non-union of the globular processes or to their absence.

Lateral harelip is much more common and may affect one or both sides—*single* or *double* harelip. When the cleft extends into the nostril it is known as a *complete* harelip whereas the less marked deformities, often merely a notch of the lip, are known as *incomplete* harelips. It is a *simple* harelip if only the soft parts are affected, if the alveolus is involved it is called *alveolar*, and if there is also a cleft palate it is *complicated*. In bilateral cases the central part of the lip projects forwards, the segment being called the *prolabium*. The nose is flattened and the ala widened even in simple cases. Other congenital deformities may be associated with harelip.

What is the best time for Operation ?

As harelip tends to interfere with nutrition in severe cases and as the deformity may be exaggerated by the movements of the muscles operation should be carried out as soon as the child is fit enough.

What is the Treatment ?

A wide variety of operations have been described. In brief the aim is (*a*) mobilise the lip on either side ; (*b*) pare the cleft ; (*c*) suture ; (*d*) prevent tension on the suture line and remove stitches early. An associated cleft palate is closed at a later date.

Describe Cleft Palate.

Cleft palate is due to the non-union of the deeper parts of the median nasal and the maxillary processes. The mildest form is a bifid uvula ; the most severe form a complete gap, uniting the anterior nares and the pharynx. Normal union of the palate takes place from before backwards. Three varieties of complete cleft occur—median, tripartite and bipartite ; the last is most common. The cleft is generally between the central and lateral incisor teeth, but sometimes it passes between the lateral incisor and canine teeth.

The cleft renders suckling difficult and at a later age is associated with a distinctive nasal speech.

What is the Treatment ?

Operation is indicated and should be carried out before the child begins to talk if the general condition will allow.

In many cases of complete cleft mobilisation, paring and suture will be successful, but in others a residual hole or cleft may require the wearing of an obturator.

Nasal and throat swabs should always be taken before operation.

Describe Cysts of the Face and Lip.

As in other parts of the body sebaceous cysts may be found, but in the face the *dermoid cyst* must be remembered. It is found along the lines of embryonic fusion, the most common site being at the outer canthus. The cyst is under the deep fascia, lies in a depression in the bone and may even be attached to the dura. These cysts should be excised.

In the lip a *mucous cyst* follows from the blocking of the duct of a mucous gland. The cyst is translucent and contains clear fluid. It should be excised.

Describe Rodent Ulcer.

Rodent ulcer is most frequently seen at the inner canthus. It is described on page 41.

Describe Epithelioma of the Lip.

Epithelioma is usually on the lower lip just to one side of the middle line. The tumour is usually the result of chronic irritation and may take the form of an indurated crack, a typical epitheliomatous ulcer or a proliferating ulcerating tumour. The disease spreads soon to the submental and submandibular glands. It must be distinguished from a primary chancre which is, however, usually on the upper lip. The treatment is to excise the tumour in the early case. Later excision of the glands should be carried out or radiation employed.

Mention the Common Diseases of the Jaws.

(a) INFLAMMATORY AFFECTIONS—

- (i) Abscess of the antrum, connected with malformation or disease of the teeth.
- (ii) From the same cause, abscess also occurs in the lower jaw or on its surface.
- (iii) Necrosis and caries may be due to this cause ; it may also arise from syphilitic or tubercular disease, or in the lower jaw from phosphorus poisoning.

(b) TUMOURS—

May affect the alveolar process (Epulis) or the body of the bone. The more common tumours are :—

- (i) Fibroma.
- (ii) Myeloma.
- (iii) Osteoma.
- (iv) Sarcoma.

- (c) CYSTS, simple and dentigerous, occur most frequently in the *body of the lower jaw*.

Describe Alveolar Abscess.

Infection arises from the root of an infected tooth and the surrounding bone becomes involved. The abscess may perforate the gum and discharge into the mouth or it may spread through the bone and rupture under the periosteum and finally discharge externally. The result is a sinus with sequestra in the bone or a puckered adherent scar. There is severe pain, swelling and œdema of the face and acute tenderness.

The affected tooth should be removed as early as possible to provide free drainage and so prevent the development of tension and osteomyelitis.

Describe Osteomyelitis of the Jaw.

This results from an alveolar abscess or may arise *de novo*. It runs a long course with the formation of numerous sequestra and much new bone. Free drainage should be secured and the general measures for septicæmia employed.

Describe Epulis.

Strictly speaking it is a tumour affecting the alveolar process of one or other jaw, though the name is often applied to tumours starting in other parts of the jaw bones and involving the alveolus secondarily.

There are two varieties :—(a) The pink epulis which is a fibroma arising from the alveolar periosteum. It is covered by normal epithelium and may be pedunculated ; (b) the purple epulis which is a giant cell tumour arising in a tooth socket. It forms a soft lobulated purple mass and may spread along the body of the mandible. It is a simple tumour, but is liable to occur after curettage.

The affected tooth is removed and the bone scraped in the first type, but in the second it will probably be necessary to remove a wedge of bone to prevent recurrence.

Describe Odontomata.

These are tumours, either solid or cystic, which arise from the dental elements of an imperfectly formed tooth. They generally affect the molar teeth, and are noticed between the ages of twenty-one and twenty-five. They may simulate alveolar abscesses, *i.e.* gumboils, or fibromata (epulis), or exostoses. Suppuration generally occurs in the cystic varieties. X-ray examination considerably facilitates the diagnosis of odontomes.

Classify Odontomata.

- (a) *Epithelial*.—A multilocular cystic tumour arising from the enamel organ—adamantinoma. Some pathologists consider it to be an endothelioma. It is usually found in the lower molar region, and tends to recur after simple measures.
- (b) *Follicular*.—Dentigerous cyst. A unilocular cyst arising from the tooth follicle. Contains a tooth. Most frequent in the lower molar region.
- (c) *Compound Follicular*.—Is similar to the follicular variety, but contains fragments of dental tissue called denticles.
- (d) *Cementoma*.—A solid tumour arising from the tooth follicle.

(e) *Fibrous*.—Arising from the tooth follicle.

(f) *Radicular*.—Arises from the dental papilla and is connected with the roots of the tooth.

(g) *Composite*.—Contains elements derived from every part of the embryo tooth. May occur in either jaw.

The treatment is to open the cyst, scrape it out, carbolise the wall and saucerise the cavity. If it recurs a wedge of the jaw will have to be excised.

How would you examine a Tumour of the Upper Jaw, and what Points is it specially important to make out ?

It may be examined from—

- | | |
|---|----------------------------|
| (a) The face. | (c) The nose. |
| (b) The orbit. | (d) The mouth and pharynx. |
| (e) The temporal and zygomatic regions. | |

The two tumours most frequently found are sarcoma, which may arise from the anterior or posterior aspect of the maxilla or from the antrum, and carcinoma, which may arise from the mucosa of the antrum or palate.

What are some of the Signs of Malignant Tumour ?

- (a) Pressure on the nasal duct, with epiphora.
- (b) Pain from implication of the trigeminal nerve.
- (c) Epistaxis.
- (d) Displacement of the palate, teeth, etc.
- (e) “Egg-shell” crackling on pressing over the tumour.
- (f) Darkness on transillumination.
- (g) Proptosis.

How would you diagnose the Point of Origin of a Sarcoma ?

(a) In the **MALAR BONE** ; pushes the cheek into a conical projection, and bulges into the mouth between the gums and cheek. Line of the teeth and palate normal.

(b) Behind the **UPPER JAW** ; the jaw is pushed forward as a whole. Line of the teeth and antrum normal.

(c) In the **ANTRUM** ; walls of that cavity expanded, bulging into the nose, mouth, orbit, and causes a projection on the face. Line of the teeth irregular.

(d) In the **ETHMOID BONE** : broadening of the root of the nose ; separation or projection of one eye outwards.

What is the Treatment ?

Excision of the maxilla is now replaced by local removal by lateral rhinotomy plus radiotherapy or by teluradium or radium therapy. The important point is early diagnosis.

Classify the Varieties of Glossitis.

(a) Acute superficial—often resulting from scalds.

(b) Acute parenchymatous—a very dangerous condition in which the inflammation, often streptococcal in character, leads to a serous exudation in the connective-tissue between the muscle-fibres. The swollen tongue protrudes from the mouth ; deglutition is impossible and respiration is greatly impeded. A backward extension of the condition will lead to œdema of the glottis.

(c) Chronic superficial or leucoplakia.

(d) Chronic parenchymatous or sclerosing glossitis which is a tertiary syphilitic manifestation.

Describe Leucoplakia.

Leucoplakia is a chronic inflammation of the superficial structures of the tongue. The condition mainly occurs in males over forty years of age. A syphilitic history can often be obtained. The exciting factors are the drinking of raw spirits, excessive smoking, and over-indulgence in condiments.

On examination, the tongue is found to be covered with whitish patches of horny epithelium, arranged in a mosaic pattern. In advanced cases warty excrescences and fissures occur.

The patient complains of discomfort in eating, of persistent thirst, and of a loss of taste.

Leucoplakia has a great tendency to develop into an epithelioma.

Give its Treatment.

Smoking, raw-spirit drinking, and all sources of buccal irritation must be stopped. Anti-syphilitic remedies are given and careful attention is paid to oral hygiene. If epithelioma develops the treatment is that of epithelioma of the tongue.

What Varieties of Ulcers are found on the Tongue ?

- (a) Catarrhal.
- (b) Traumatic.
- (c) Tuberculous.
- (d) Syphilitic.
- (e) Epitheliomatous.

Contrast Gumma, Epithelioma, and Tuberculous Ulcer of the Tongue.

| | GUMMA. | EPITHELIOMA. | TUBERCLE. |
|-------------------------|---|--|--|
| <i>Situation</i> . | Centre of dorsum. | Edge of tongue. | Tip of tongue. |
| <i>Pain</i> . | Painless. | Severe, and shoots towards ear. | Severe in late stages, painless at first. |
| <i>Lymphatic Glands</i> | Unaffected. | Early enlargement. | Sometimes affected. |
| <i>Induration</i> . | Only when an ulcer forms. | Marked, preventing free protrusion of the organ. | Nil. |
| <i>Appearance</i> | When it breaks down the edges are steep and often undermined; wash-leather like slough. | Warty or fissured. The edges and base are very hard. | Friable edges, feeble granulations, yellowish discharge. |
| <i>Treatment</i> . | As for all tertiary syphilitic lesions. | In early cases, excision ; in others, radium therapy. The cervical glands should be excised. | If possible excise the ulcer. |

What Cystic Swellings are found in the Mouth ?

- (a) Lingual dermoids.
- (b) Thyro-glossal tumours.
- (c) Retention cysts.
- (d) Ranula.

Describe Lingual Thyroid.

These cystic swellings arise in the thyro-glossal tract, which leads from the foramen cæcum to the thyroid isthmus. Microscopically, they are lined with ciliated epithelium, and often contain colloid substance. The mucous membrane covering the cyst wall is very vascular. These cysts are most commonly met with in young girls about puberty. The main clinical features are :—

- (a) Dark-red colour.
- (b) Repeated attacks of hæmorrhage.
- (c) Variations in size.
- (d) Soft on palpation.
- (e) When large they interfere with deglutition and speech.

The treatment consists in painting them with an astringent paint, and in giving potassium iodide (Butlin). If causing trouble, they should be carefully dissected out.

The lingual thyroid may be the only thyroid tissue present when its removal will result in myxœdema.

What are Lingual Dermoids ?

These occur below the tongue in the interval between the genio-hyoglossi muscles. The capsule is usually fixed to the genial tubercles by a tough fibrous band. The cysts are lined by squamous epithelium. The cyst wall pits on firm pressure. On opening into the cyst, the contents resemble the yoke of a hard-boiled egg. Other clinical features are :—

- (a) Indistinct speech.
- (b) Dribbling of saliva.
- (c) Occasionally dyspnoea from backward pressure upon the epiglottis.

Distinguish between Retention Cysts and Lingual Dermoids.

| | RETENTION CYSTS. | LINGUAL DERMIDS. |
|-------------------|---------------------------------|---|
| <i>Site</i> . . | To one side of the middle line. | In the middle line between the genio-hyoglossi muscles. |
| <i>Colour</i> . | Purple. | Yellow. |
| <i>Appearance</i> | Translucent. | Opaque. |

Both varieties of cysts should be dissected out.

Define a Ranula.

A ranula is defined as being any cystic tumour arising from the glands situated in the floor of the mouth. It is not a retention cyst, but is the result of a cystic degeneration. The fluid contents are very viscid, and contain a large amount of epithelial debris and mucin. Unlike saliva, no pytaline or sulphocyanide of potassium is present.

Give the Clinical Features of Sublingual Ranula.

This is the most common form of ranula, and has the following characters :—

- (a) Tense, painless, and globular in shape.
- (b) Bluish colour.
- (c) Lies to one side of the frenum.
- (d) Does not pit on pressure.
- (e) A probe can be passed along Wharton's duct.

The treatment consists in incising the mucous membrane over the cyst and dissecting it out. If this fails the cavity should be packed and allowed to granulate.

What is the Etiology of Parotitis ?

Two varieties of parotitis occur, non-suppurative and suppurative. The main non-suppurative form is mumps.

Suppuration may arise from—

- (a) Buccal sepsis.
- (b) Purulent arthritis of the temporo-maxillary articulation.
- (c) Pyogenic diseases of the jaws.
- (d) Post-operative parotitis.

Give the Clinical Features of Mumps.

The disease generally attacks young children, and involves both glands. Usually the mumps lasts from seven to twelve days. Locally, the gland is swollen and painful, the pain being aggravated by any movement of the jaws. In many cases orchitis supervenes, which may terminate in testicular atrophy.

Mention the Signs of Suppurative Parotitis.

The gland is brawny, swollen, and extremely tender. Later, it becomes red, and fluctuation can be elicited. Owing to the great pain, the mouth is kept closed. Within a few days suppuration occurs, the resulting abscess burrowing in the deep planes of the neck. Very serious complications may ensue from :—

- (a) Erosion of the carotid arteries or internal jugular vein.
- (b) Mediastinitis.
- (c) Retro-pharyngeal abscess.
- (d) Septic arthritis of the temporo-maxillary joint.
- (e) Facial paralysis.
- (f) Salivary fistulæ.

The treatment is early and adequate incision otherwise extensive sloughing of the gland will occur.

Describe Salivary Fistulæ.

There are two varieties (a) those of the gland—*parotid fistula* and (b) those of Stenson's duct—*duct fistula*. The former results from suppuration occurring in the gland, *e.g.* abscesses around salivary concretions. Duct fistulæ arise from a wound of Stenson's duct, only rarely from an abscess.

Contrast the Two Varieties of Salivary Fistulæ.

| | PAROTID. | DUCT. |
|------------------------------|--|------------------------------------|
| <i>Cause</i> . | Suppuration. | Injury. |
| <i>Site</i> . | Anywhere over the gland. | Over the buccinator muscle. |
| <i>Discharge of Saliva</i> . | Usually dry between meals. | Continuous discharge of saliva. |
| <i>Prognosis</i> . | Tend to close without treatment. | Require an operation. |
| <i>Treatment</i> . | In persistent cases pare and suture the edges. | Make a new opening into the mouth. |

Describe Salivary Calculi.

Salivary calculi are formed by the action of oral micro-organisms upon the saliva. They generally occur in the submaxillary gland or in Wharton's duct. Chemically, they consist of calcium carbonate and phosphate. In appearance they are whitish-grey, and are rough to the touch.

Give the Symptoms.

- (a) Sharp, stabbing pain on deglutition.
- (b) Marked swelling of the gland during meals.
- (c) The calculus can be palpated.
- (d) The contents can be discharged from the swelling by digital pressure.
- (e) The site of the calculus can be detected by passing a probe along Wharton's duct.

The treatment is to make an incision through the mucosa overlying the stone and lift it out.

Describe Tumours of the Salivary Glands.

Adenoma and carcinoma are very rare, the common tumour being the *mixed tumour* which almost invariably affects the parotid gland. The tumour may grow slowly

and suddenly become rapidly larger. The tumour is usually superficial in the gland and in the early stages is encapsulated. If facial paralysis is present the tumour is probably malignant.

The tumour should be removed.

What Malignant Tumours occur in the Tonsils ?

- (a) Sarcoma.
- (b) Epithelioma.
- (c) Lympho-epithelioma.

Cancer is more common than sarcoma.

Give the Clinical Features of Lympho-sarcoma.

Although originating in the tonsil, the neoplasm quickly invades the peritonsillar tissues and the soft palate. Being nodular, and of a paleish colour, the tumour resembles a quinsy. Owing to the swelling the patient complains of dysphagia and dyspnoea. At a later stage ulceration occurs. Cachexia is usually a pronounced feature, likewise involvement of the deep cervical lymphatic glands.

Describe Cancer in the Tonsil.

This disease causes considerable suffering and discomfort. The chief signs and symptoms are :—

- (a) Enlargement of the glands of the anterior triangle of the neck.
- (b) Dysphagia and dyspnoea.
- (c) Pain on deglutition, the pain often shooting towards the ear.
- (d) Salivation.
- (e) On digital examination, an indurated swelling will be detected.
- (f) Cachexia.

The treatment is radium therapy.

Describe Carcinoma of the Pharynx and Larynx.

Carcinoma occurs in the larynx (intrinsic cancer) and also in the pharynx in close proximity to the larynx (extrinsic cancer). The tumours are squamous epitheliomata.

Extrinsic tumours are divided into two types, (a) epilaryngeal, (b) hypopharyngeal.

The *epilaryngeal cancer* arises from the epiglottis, ary-epiglottic fold or piriform recess, and is commoner in men than women and usually after fifty years of age. Tickling in the throat and dysphagia are the symptoms. Glands involved late.

The *hypopharyngeal carcinoma* occurs in women before the age of forty in the lateral or posterior wall behind the cricoid. There is a long history of dysphagia. The tumour may obstruct the œsophagus.

The *intrinsic carcinoma* arises in the vocal cords or in the subglottic area. The tumour occurs in men over fifty and grows very slowly. The glands are involved at a late stage and the symptoms are hoarseness, aphonia and spasmodic dyspnoea.

What is the Treatment ?

Extrinsic carcinoma may be treated by lateral pharyngotomy or by radium. Intrinsic carcinoma in the early stage may be treated by laryngo-fissure with local removal of the tumour or by laryngectomy or by radium.

Describe Pharyngeal Diverticulum.

Pharyngeal pouch is a diverticulum passing through the posterior pharyngeal wall between the thyro-pharyngeal and crico-pharyngeal parts of the inferior constrictor. The condition occurs in middle-aged males who have had long standing dysphagia. The pouch passes downwards behind the œsophagus which it displaces forwards making swallowing more difficult and then usually passes to the left. Food collects in the sacculus where it decomposes, leading to an offensive odour. The distended diverticulum causes dysphagia. Regurgitation of the contents of the pouch is a common feature, and the ejected material is free from pepsin and hydrochloric acid. Sometimes after taking food the diverticulum can be distinctly seen in the neck. The opening of the sacculus is readily distinguished with the œsophagoscope.

What is its Treatment?

The pouch is emptied by the œsophagoscope. It is exposed in the neck and brought to the surface to be excised at a later stage. The freeing and stitching of the sac at a higher level (diverticulopexy) is not advisable as carcinoma may develop.

THE NECK.*What are the Varieties of Torticollis?*

- | | | |
|----------------|---|--|
| (a) Acute | { | Rheumatoid. |
| | | Irritation of tubercular glands. |
| | | Reflex from teeth, ear, or nose. |
| (b) Spasmodic. | | |
| (c) Chronic | { | Congenital. |
| | | Acquired from hæmatoma in sterno-mastoid during delivery; gumma of sterno-mastoid; severe burns or injuries of lateral aspect of neck. |

Describe Acute Torticollis.

Acute torticollis results from a fibrositis of the sheath of the sterno-mastoid muscle following exposure to cold. Beyond the fact that it is an extremely painful condition, it is of no great importance. The treatment is to apply warmth, gentle massage, and give a brisk purge. Acetyl-salicylic acid is a very useful remedy in this as in all "rheumatic" affections of muscles.

What is the Pathology of Congenital Torticollis?

Torticollis may be due to a failure of development of one half of a cervical vertebræ, but the common variety is due to a fibrous contracture of one or both heads of the sterno-mastoid muscle.

Shortly after birth a firm ovoid swelling develops in the lower part of the muscle. This swelling consists of young fibrous tissue and degenerated muscle fibres. It gradually

disappears and as the fibrous tissue contracts the deformity appears.

What are its Clinical Features ?

- (a) The head is laterally flexed on the affected side, and rotated so that the chin points towards the opposite side.
- (b) Atrophy of the facial muscles on the affected side.
- (c) The transverse axis of the mouth and eyes converge on the contracted side.
- (d) Drop a vertical line from the lobule of the ear ; it falls to the inner side of the centre of the clavicle, instead of outside it.
- (e) The affected sterno-mastoid is more vertical than normal ; it feels very hard, but is not tender.
- (f) In advanced cases a scoliosis develops with the concavity on the side of the contraction.

How should it be treated ?

In the early case passive stretching will often be sufficient to prevent the deformity developing.

In the established case the contracted structures should be divided. This may be done by subcutaneous myotomy or better by open operation. A halter may be worn for some months to prevent recurrence.

Describe Spasmodic Torticollis.

The etiology of this form of wry-neck is very uncertain, but it is probably due to some irritation of the cortical centres of the sterno-mastoid and trapezius of the contracted side, and of the post-vertebral rotator muscles of the opposite side. The deformity is accompanied by constant jerking of the head. The patient becomes intensely neurotic, and suffers from insomnia.

Indicate the Treatment.

In mild cases massage and tonics may do good for a time ; in severe cases an operation must be performed. This consists in dividing the spinal accessory nerve on the

contracted side, and the posterior branches of the first three cervical nerves (or division of the muscles supplied by those nerves) on the opposite side.

Describe Ludwig's Angina.

The term, Ludwig's angina, is applied to a very virulent streptococcal suppurative cellulitis of the neck. It commences in the submaxillary region as a peri-lymphadenitis, and generally causes death, either from septicæmia or from oedema of the glottis.

Mention its Chief Clinical Features.

- (a) A brawny swelling of a dark red colour, commencing beneath the jaw and spreading rapidly.
- (b) Marked pain on moving the head.
- (c) Fluctuation cannot be elicited.
- (d) Laboured respiration, sometimes calling for tracheotomy.
- (e) Dysphagia.
- (f) Irritative phenomena, from pressure on the nerves of the neck.
- (g) The usual constitutional symptoms associated with profound septicæmia.

Give its Treatment.

When seen early, an attempt may be made to abort the disease by applying hot fomentations to the neck. When pus has formed, then several incisions should be made over the brawny area, and the deep cervical fascia carefully opened. Drainage should be provided for. Internally, the general treatment for septicæmia should be adopted and sulphanilamide or sulphapyridene given in full doses.

What Cysts and Fistulæ are found in the Neck?

- (a) Branchial cysts and fistulæ.
- (b) Thyroglossal cysts and fistulæ.

A *branchial fistula* or cyst is due to a failure of closure of the cervical sinus. The orifice of a branchial fistula is found along the anterior border of the sterno-mastoid

muscle usually at its lower end. The fistula passes upwards between the internal and external carotid arteries with the ninth nerve deep to it and the seventh and twelfth superficial to it.

The only symptom is the discharge of glairy mucus. Infection may occur. The fistula should be dissected out.

A *branchial cyst* forms a rounded painless tense swelling in the anterior triangle. It is lined with squamous epithelium and the fluid contains cholesterol crystals. The cyst should be excised.

A *thyro-glossal cyst* arises from part of the thyro-glossal duct which leads from the foramen cæcum to the isthmus of the thyroid gland. The cyst lies in the mid line of the neck, is painless and moves upwards on deglutition or on protrusion of the tongue. It should be excised.

A *thyro-glossal fistula* is never congenital, but follows the incision or rupture of a thyro-glossal cyst. The fistula should be dissected out.

Mention the Sites of Criminal Incised Wounds of the Neck.

Suicidal and homicidal wounds of the neck may be in one of four situations.

- (a) Above the hyoid.
- (b) Through the thyro-hyoid space.
- (c) Through the larynx.
- (d) Through the trachea.

What are the Structures damaged when above the Hyoid ?

The muscles between the hyoid bone and the mandible, namely, the mylo-hyoid, genio-hyoid, digastric, hyo-glossus, and genio-glossus will be divided. The lingual vessels, together with the lingual and hypoglossal nerves are also severed. Note that the act of deglutition is impaired because of the injury to the elevators of the larynx.

Describe Injury through the Thyro-hyoid Space.

The thyro-hyoid space is the most common site of suicidal cut-throat. Incisions through the area, after dividing the depressors of the hyoid bone, and the thyro-hyoid membrane

may detach the epiglottis and open the pharynx. The superior thyroid artery is cut, and asphyxia may ensue from the hæmorrhage into the respiratory passages, or from subsequent œdema of the glottis.

Classify Goitre Pathologically.

- | | | |
|------------|---|---------------------------------|
| (a) Simple | { | Hypertrophic or parenchymatous. |
| | | Colloid. |
| | { | Adenomatous or nodular. |
| (b) Toxic | | Primary or exophthalmic. |
| | { | Secondary or toxic adenoma. |

What is the Etiology ?

It is now established that deficiency of iodine in the drinking water or in the soil or a failure to absorb iodine produces a hypertrophy of the thyroid tissue. Hypertrophy is also called for by the varying needs of the body, *e.g.* at puberty and during pregnancy. As the demand for increased thyroid secretion passes off, or following an adequate intake of iodine, the hypertrophy gives place to involution. With this repeatedebb and flow we would expect to find the hypertrophic thyroid, the gland which has undergone involution and a gland showing areas of involution and hyperplasia as they have responded differently to the stimulus. These three types are respectively the simple parenchymatous goitre, the simple colloid goitre, and the simple nodular or adenomatous goitre.

What are the Signs and Symptoms of Goitre ?

- (a) A horse-shoe shaped swelling in the front of the neck.
- (b) The skin is freely movable over the goitre, and the superficial veins are greatly distended.
- (c) Notice that the tumour cannot be moved vertically, but can be moved transversely.
- (d) The goitre moves with the larynx during deglutition.

- (e) A varying degree of dyspnoea.
- (f) Rarely, the recurrent laryngeal nerve may be pressed upon.

What is the Treatment of Simple Goitre ?

The simple parenchymatous goitre is treated by the administration of iodine and the only indication for surgery is to relieve pressure on the trachea. Simple colloid goitre rarely calls for surgical treatment. In the adenomatous type the response to iodine is not satisfactory and operation is justifiable to prevent the development of toxic symptoms.

What are the Clinical Features of Thyrotoxicosis ?

In Graves' disease or exophthalmic goitre a thyrotoxicosis occurs. According to Plummer the clinical features come on in the following order in an untreated case :—

- (a) Cerebral stimulation.
- (b) Vaso-motor disturbances of skin : the commonest is sweating.
- (c) Tremors.
- (d) Mental irritability.
- (e) Tachycardia.
- (f) Asthenia and loss of weight.
- (g) Cardiac insufficiency.
- (h) Exophthalmos and eye signs—Von Græfe's sign, etc.
- (i) Diarrhoea.
- (j) Vomiting.
- (k) Mental depression.
- (l) Jaundice.
- (m) Death.

Other features are :—(a) Moderately enlarged thyroid gland ; (b) anæmia ; (c) throbbing of the carotid and sub-clavian arteries ; (d) increased basal metabolic rate ; (e) lymphocytosis, but a diminished number of leucocytes ; (f) increased coagulation time,

What are the Clinical Features of Toxic Adenomata ?

- (a) A growing thyroid swelling has been noticed for several years (average is $14\frac{1}{2}$), before signs of hyper-secretion occur.
- (b) Toxic adenomata are usually found later in life than exophthalmic goitres.
- (c) High blood pressure. Auricular fibrillation.
- (d) No exophthalmos. Nervous features less marked.
- (e) The remaining features closely resemble those of Graves' disease.

What is the Microscopical Anatomy of Graves' Disease (Exophthalmic Goitre) ?

- (a) Hyperplasia of the epithelium lining the vesicles.
- (b) Appearance of little islets of eosinophil cells and masses of lymphoid cells.
- (c) Disappearance of colloid matter from the vesicles.

What is the Treatment of Toxic Goitre ?

Primary toxic goitre is treated by complete rest and the administration of iodine with a high carbohydrate diet. When the toxic features have subsided or no further improvement is being obtained operation should be performed. The operation of choice is sub-total thyroidectomy which may be carried out under local or general anaesthesia. Radium treatment is not advised. Some cases respond so well to medical measures that operation may not be required.

In secondary toxic goitre operation is required and should be done as early as possible before signs of cardiac failure develop. The pre-operative treatment is the same.

Describe Malignant Goitre.

In the majority of cases carcinoma of the thyroid begins in women over fifty who have been the subjects of goitre

for a considerable time. The signs and symptoms are :—

- (a) Hard nodular swelling, which is fixed and moves very little during deglutition.
- (b) Pain.
- (c) Enlargement of the deep cervical lymph glands.
- (d) Embarrassed respiration.
- (e) Dysphagia.
- (f) Recurrent laryngeal nerve involvement.

The secondary tumours usually arise in bone and the skull is a common site. The treatment in early cases is by excision, in later cases palliation by X-rays or radium is the only method available.

ŒSOPHAGUS.

Describe the Various Methods used in Examining the Œsophagus.

(a) *Palpation*.—This method is only applicable to the cervical portion.

(b) *Auscultation*.—While the patient slowly drinks a tumbler of water the stethoscope is applied along the left side of the thoracic spine opposite the usual sites of stricture.

(c) *X-rays*.—Barium swallows under the screen have replaced auscultation. Any obstruction is visualised and films reveal the nature of the stricture and the condition of the œsophagus above it.

(d) *The Œsophagoscope*.—Endoscopy allows the exact localisation of a stricture. If its nature be in doubt a biopsy may be done. In addition bougies may be passed or foreign bodies removed.

Describe Diverticula of the Œsophagus.

An œsophageal diverticulum is produced either by pressure from within or by traction from without (pulsion

and traction). The latter usually follows the cicatrisation of tuberculous bronchial glands, is on the anterior wall, and its apex is at a higher level than its opening so that it causes no symptoms. Pulsion diverticula are very rare.

Name the Varieties of Stricture of the Œsophagus.

- (a) Cicatricial.
- (b) Spasmodic.
- (c) Malignant.

Give the Causes and Sites of the Cicatricial Variety.

The chief causes are :—

- (a) Swallowing of caustics.
- (b) Healing of tubercular and syphilitic ulcers.
- (c) Trauma.

The commonest sites are opposite the cricoid cartilage, and at the cardiac opening into the stomach. Dilatation of the tube above the stricture generally occurs, leading to an accumulation of food debris.

Mention its Clinical Features.

- (a) A gradually increasing difficulty in swallowing.
- (b) A complaint of great hunger and thirst.
- (c) Progressive emaciation.
- (d) Regurgitation of the contents of the dilated portion of the œsophagus. Distinguish this from vomiting by (i) the unaltered character of the food ; (ii) its alkaline reaction ; and (iii) by the absence of pepsin.
- (e) Hawking up of viscid mucus between meals.
- (f) Pain, shooting either to the epigastrium or the scapular region.

The diagnosis is verified by the introduction of the œsophagoscope and by X-ray examination.

What is its Treatment ?

The stricture is dilated by the passage of bougies through the œsophagoscope. If this method of intermittent dilatation fails it may be possible to pass a tube through the stricture and gradual dilatation occurs. In cases where this is impossible gastrostomy may be required.

Describe Cancer of the Œsophagus.

The variety of carcinoma occurring in the œsophagus is a squamous epithelioma. The most common sites are at the crossing of the left bronchus and at the opening in the diaphragm. In women it is more common in the cervical portion. It is uncommon before the age of forty. Remember that the growth has usually involved a considerable area before any definite symptoms appear. The cervical and bronchial glands are generally involved. As the growth increases, important structures in the immediate vicinity are affected, especially the respiratory passages, the large blood vessels, and the recurrent laryngeal nerves.

What are its Clinical Features ?

The signs and symptoms of malignant disease resemble in a great measure those of cicatricial stricture. The chief differences are :—

- (a) In addition to attacks of regurgitation, actual vomiting frequently occurs.
- (b) Hunger is absent.
- (c) The regurgitated and vomited material is often tinged with blood.
- (d) Dysphagia is intermittent, not persistent.
- (e) Emaciation is more rapid owing to cachexia supervening.
- (f) Excessive salivation.
- (g) On barium swallow examination the œsophagus above the stricture is not dilated. The stricture is shown as an irregular narrowed trickle of barium.

- (h) Œsophagoscopy reveals the tumour and the extent of its fixation may be determined.

What is the Treatment ?

Excision of the tumour by the transpleural route is practicable in early cases. In other cases the introduction of Souttar's tube or gastrostomy may give some relief, but the prognosis is bad.

Describe Cardiospasm.

This is a condition in which spasmodic contraction of the lower part of the œsophagus leads to recurrent interference with deglutition.

Etiology.—Many theories have been put forward as an explanation of this condition, the principal ones being :—

- (a) Congenital malformation.
- (b) Phrenospasm or failure of relaxation at the opening in the diaphragm.
- (c) Cardiospasm, *i.e.* spasm of the sphincter.
- (d) Achalasia or failure of relaxation of the normal tone.

Give the Clinical Features.

- (a) Dysphagia—often intermittent—both for solids and liquids.
- (b) Sometimes solids can be swallowed more easily than liquids.
- (c) A feeling of weight in the thorax on attempts at deglutition.
- (d) Regurgitation of undigested food : the food showing no evidence of gastric digestion, and no free hydrochloric acid.
- (e) X-ray examination reveals the dilated œsophagus ending below in a smoothly tapering stricture at the level of the diaphragm. Peristalsis is usually active.
- (f) Œsophagoscopy will clinch the diagnosis in doubtful cases.

What is the Treatment ?

Treatment may be by intermittent dilatation at first by bougies passed through an œsophagoscope. Later the patient is taught to use Hurst's mercury bougie. In cases with marked dilatation œsophago-gastrostomy may be carried out and recently sympathectomy has been advocated. It is claimed that spinal anæsthesia may be sufficient to restore the nervous balance. Digital dilatation through the stomach is another method which has given good results.

VERTEBRAL COLUMN AND SPINAL CORD.

Deformities of the Spine.

Mention the Deformities of the Spine.

- (a) Scoliosis = a lateral curvature, with rotation of the bodies of the vertebræ.
- (b) Kyphosis = a curvature with convexity posterior.
- (c) Lordosis = curvature with anterior convexity.

Describe Scoliosis.

Scoliosis may be a disease in itself or the symptom or manifestation of some other disease process. It may be classified into two groups:—(a) *postural or functional scoliosis*; (b) *structural or organic scoliosis*. In postural scoliosis the deformity can be corrected and it is not associated with any bony changes in the vertebræ unless it is left untreated. Structural scoliosis may result from:—

- | | | |
|--------------------------|---|---|
| Spinal causes | { | Congenital, <i>e.g.</i> hemi-vertebra. Inflammations, <i>e.g.</i> tuberculosis. Bone diseases, <i>e.g.</i> rickets. Tumours—simple or malignant. |
| Extra-spinal causes | { | Deformity, <i>e.g.</i> torticollis. Thoracic disease, <i>e.g.</i> empyema. Paralysis of muscles (unilateral). |
| Posturo-structural type. | | |

Describe Postural Scoliosis.

The cause of this deformity is not known, it arises in children or adolescents and is more frequent in girls than boys.

In the majority of cases the primary curve develops in the dorsal region of the spine, the convexity of the curve being on the right side. Compensatory curves are found in the cervical and lumbar regions. The bodies of the vertebræ are rotated so that they point towards the convexity of the curve, and the spinous processes towards the concavity.

The bodies become wedge-shaped, the apex of the wedge facing the concavity. Following upon the osseous changes, the ligaments and muscles upon the convex side are elongated, while those upon the opposite side are shortened and contracted. On examining the ribs it will be noticed that they bulge *behind* on the *convex* side, and bulge in *front* on the *concave* side. Other changes in the skeleton are—decrease in the general stature, and the formation of a scoliotic pelvis.

The signs and symptoms are :—

- (a) The patient is easily tired.
- (b) The deformed vertebral column.
- (c) The deformed chest.
- (d) Elevation of the right scapula and nipple.
- (e) Well-marked infracostal furrow on left side.
- (f) Large “ brachio-thoracic triangle ” on left side.
- (g) Often embarrassed respiration.
- (h) X-ray is negative in the early stages, but must always be carried out to exclude a structural cause for the deformity.

What is the Treatment ?

- (a) Prevention by the careful training of children who suffer from weak muscles or who assume faulty postures.
- (b) In the early case improve general health and exercises under skilled supervision.
- (c) Support may be worn if deformity relapses between treatments.

- (d) Posturo-structural cases may be treated by traction on Whitman frame or by suspension and the application of a plaster jacket. Special frames are employed for forcible correction of the deformity. More gradual correction by the Abbott type of jacket may be used.

Describe Lordosis.

Lordosis is invariably due to other lesions and is compensatory to them, *e.g.* congenital dislocation of the hip or fixed flexion deformity. It is always found in the lumbar spine and the treatment is that of the primary lesion.

What are the Causes of Kyphosis ?

Kyphosis may affect one vertebra or may be a diffuse deformity. It arises from many causes which may be classified as follows :—

- (a) Trauma { Recent—compression fractures.
Old—Kümmell's disease.
- (b) Localised disease of vertebra { Inflammatory—tuberculosis.
Osteochondritis—Calve's disease.
Neoplastic—myeloma, secondary carcinoma, etc.
- (c) Bone diseases, *e.g.* rickets, osteitis deformans.
- (d) Postural type.
- (e) Lesions of intervertebral discs, *e.g.* kyphosis dorsalis juvenilis (Scheuermann's disease).

The treatment depends on the cause.

What is Spina Bifida ?

This is a congenital malformation due to imperfect development of the laminae and spinous processes. Owing to the failure of union of the posterior segments of the

neural arches, the contents of the vertebral canal form a localised swelling, most commonly in the lumbar and sacral regions. Other congenital defects such as harelip, cleft palate, etc., frequently co-exist with a spina bifida.

Mention its Varieties.

- (a) MENINGOCELE . = Membranes and cerebro-spinal fluid.
- (b) MYELO-MENINGOCELE = Membranes, cerebro - spinal fluid, and a few spinal nerves.
- (c) SYRINGO-MYELOCELE = Spinal cord and a dilated medullary canal.
- (d) MYELOCELE . . = Spinal cord.
In this form the integument is absent over the affected vertebræ, and hence a myelocele is incompatible with life.
- (e) OCCULTA . . = No swelling, merely an absence of the posterior segments of the neural arches

Give its Clinical Features.

A smooth globular swelling, often translucent, and becoming tense when the child strains or coughs. If the swelling be pressed upon, it will be observed that the anterior fontanelle bulges. [This test must be applied very cautiously, or convulsions may be brought on.] Pressure upon the sac also leads to slowing of the pulse. In some cases the lower limbs, the bladder, and the rectum are paralysed.

Treatment is by operation in the first two types, but this is not indicated in the presence of hydrocephalus or if other severe congenital anomalies coexist.

What is Pott's Disease of the Spine?

Tuberculous of the bodies of one or more vertebræ. The disease is most common in children before the age of ten, but may occur in adults. It is most frequent in the

dorso-lumbar region of the spine. The disease involves the body of the vertebra :—central, the anterior surface under the periosteum :—periosteal or in the region of the secondary epiphyses :—epiphyseal. The articular processes of the vertebra are very rarely involved and therefore dislocation is infrequent. The infection may be conveyed to the vertebra by the blood or lymphatics.

The cancellous bone becomes replaced by tuberculous granulation tissue, débris and pus, and collapse of the vertebral body occurs. The expression of diseased tissue by the collapse leads to abscess formation and may also cause pressure on the cord from œdema of its coverings, by the pressure of pus or granulation tissue or by the mechanical pressure of vertebral displacement due to the disease. The intervertebral discs are also invaded by the disease.

Mention its Leading Features.

- (a) Pain on pressure over the diseased vertebræ ; also pain on striking the soles of the feet or the crown of the head.
- (b) Rigidity ; perhaps the most important sign for diagnostic purposes.
- (c) Deformity.
- (d) Frequently abscess formation.
- (e) Evidence of pressure upon the spinal cord or nerve roots. The signs are mainly motor, *i.e.* paresis of the muscles supplied from the area of the cord below the lesion.

The order of pressure effects is :—

- (a) Paresis.
- (b) Increased reflexes.
- (c) Spastic paralysis.
- (d) Contractures and deformity.

Mention the Different Areas in which Referred Pain occurs in Pott's Disease.

UPPER CERVICAL REGION = occiput.

LOWER CERVICAL REGION = shooting down the arms.

| | |
|---------------------|---------------------------------|
| DORSAL REGION . . . | =a sternal or intercostal pain. |
| DORSI-LUMBAR REGION | =epigastrium. |
| LUMBAR REGION . . . | =a sciatica-like pain. |

From what Conditions must it be Diagnosed ?

Pott's disease of the spine must be diagnosed from all other causes of kyphosis (see p. 342), from osteomyelitis, syphilis and arthritis, and in addition the referred pain closely simulates acute abdominal emergencies. In adults secondary carcinoma is likely to give rise to difficulty.

Describe Pott's Disease of the Cervical Region.

In the majority of cases the upper part of the vertebral column, *i.e.* atlas or axis, is affected. The patient keeps his neck perfectly rigid and rests his chin upon the palm of his hand. Rotation of the head and nodding movements cause considerable pain, and are only performed very slowly and incompletely. Neuralgic pains affect the occipital region, owing to the irritation of the upper posterior cervical nerves. Any abscess forming will be retro-pharyngeal in position and tend to cause pressure upon the glottis. It may point behind the sterno-mastoid muscle which serves as the guide for aspiration or incision of the abscess.

Describe Pott's Disease of the Dorsal Region.

The back is held rigidly, so that in order to pick up an object from the ground, the patient bends the hips and the knees. If the flat hand be placed upon the spines of the affected vertebræ and the patient asked to bend forward, it is noticed that the vertebræ move *en bloc* and not individually. No hyper-extension of the spine occurs when the lower limbs are raised with the child in the prone position. Muscular rigidity causes a spasmodic or grunting type of respiration. When the child bends well forward the

vertebral column instead of presenting a uniform curve shows a flattening at the site of disease. A sharp kyphosis is often found. An abscess forming in this region can point—

- (a) Between the pleura and the ribs.
- (b) Into the pleural cavity.
- (c) Along the intercostal vessels on the chest-wall.
- (d) From the lower dorsal region pass beneath the internal arcuate ligament, enter the sheath of the psoas, and form a psoas abscess.

What are the Features of Pott's Disease of the Lumbar Region ?

The child when standing supports his vertebral column by leaning forward and resting his hands upon his thighs. In early cases the child walks with a well-marked lordosis. A "belly-ache" pain is a frequent symptom. If pus forms, it usually escapes either through the lumbar triangle (of Petit) as a lumbar abscess, or enters the sheath of the psoas.

What is the Treatment ?

Treatment must be on general sanatorium lines. The local treatment must aim at (a) the correction of the deformity ; (b) immobilisation until healing is sound and confirmed by X-ray examination ; (c) gradual rehabilitation and later ambulatory treatment.

In the cervical spine the acute lesion is treated by traction and when the muscle spasm has been overcome by the application of a Minerva plaster jacket.

In the dorsi-lumbar spine hyperextension with or without traction on a Whitman frame is the best treatment, and this may be followed by the application of a plaster shell which allows the patient to be placed in the anterior half in the prone position and renders easier the preservation of the skin.

Abscesses may require aspiration and incision, and great care must be taken to avoid secondary infection.

Fusion operations may be performed to prevent deformity during the recovery stages.

Describe Osteomyelitis of the Spine.

Most cases occur as the sequel to infection in another part of the body. The causal organism is nearly always staphylococcus aureus. The lesion is in order of frequency in the lumbar, dorsal, cervical and sacral spine. It may involve the body or the processes of the vertebra. Abscess formation is almost invariable and in some cases the epidural space is invaded causing pressure on the cord or meningitis. Constitutional signs may be marked or almost absent. In fulminating cases diagnosis is unlikely, but less acute cases cause severe pain, rigidity and tenderness. X-ray changes of bone destruction, sclerosis and new bone formation are seen in chronic cases and ankylosis of the intervertebral joints is likely. If neurological symptoms and signs are present recovery is unlikely.

Treatment on general lines, immobilisation of the spine, drainage of abscesses, and laminectomy for relief of pressure are the outlines of treatment.

Describe Osteo-arthritis of the Spine.

Osteo-arthritis in the spine is similar to that elsewhere. It occurs chiefly in middle-aged males and is common in those whose work makes heavy demands on their backs. The articular cartilage and the intervertebral discs are absorbed and osteophytes grow from the margins of the vertebræ. The signs and symptoms are :—

- (a) Pain either local or referred.
- (b) Stiffness of the back.
- (c) Loss of mobility.
- (d) A diffuse kyphosis.

Treatment is palliative by local heat or short wave diathermy.

What is Spondylitis Ankylopoietica ?

This is the name given to the disease previously called spondylitis deformans and often divided into two types (Marie Strumpell, Von Bechterew). The etiology is still in doubt, but it may be an insidious disease or may follow rheumatic fever, gonorrhœa or septicæmia. The main feature is that it attacks younger patients and leads to absolute rigidity of the spine with ossification of the ligaments and ankylosis of the joints. In early cases the first change may be a loss of joint space of the sacro-iliac joints, but in late cases the typical bamboo spine is seen on X-ray.

The only possible treatment is to make certain that ankylosis occurs in good position.

What is Chronic Spinal Meningitis ?

This is a localised serous spinal meningitis generally affecting the lower dorsal region. It occurs in adults, often with a history of syphilis, gonorrhœa, or influenza. Pathologically, the theca is distended with a serous effusion, the cord is flattened, the nerve-roots buried in adhesions, and the periphery of the cord sclerosed. The symptoms closely resemble those of a spinal tumour, the two chief differences being (a) the pain is more diffuse in distribution, first involving the whole of one leg, then spreading to the other leg ; (b) the paralysis affects the whole leg and not a group of muscles.

The treatment is laminectomy.

Injuries of the Spinal Cord.

Classify Injuries of the Spinal Cord.

- (a) Spinal concussion. Clinically this is manifested by a temporary paraplegia. Priapism is absent. The condition generally occurs in the cervical region. Recovery in 36–48 hours.

- (b) Spinal hæmorrhage.
- (c) Spinal compression.
- (d) Complete transverse lesion.

Spinal concussion can only be diagnosed from a complete transverse lesion by its recovery and is a rare condition.

What are the Varieties of Hæmorrhage of the Cord ?

- (a) Extra-medullary = HÆMATORRACHIS.
- (b) Intra-medullary = HÆMATOMYELIA.

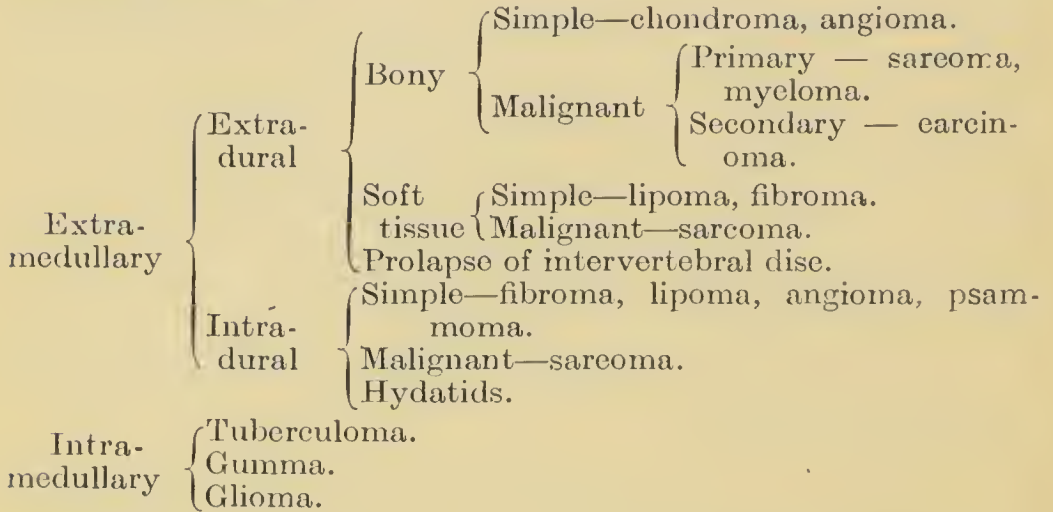
The main differences between the two are shown in the accompanying table.

| EXTRA-MEDULLARY. | INTRA-MEDULLARY. |
|---|--|
| Symptoms of irritation first, <i>i.e.</i> cramps, hyperæsthesia, etc.; paralysis later, and coming on gradually. Usually the arms are affected earlier than the legs. The patient may be paralysed from below upwards (gravitation paraplegia). | Paralysis comes on immediately. If the hæmorrhage only causes pressure, the legs are first affected—if the hæmorrhage is so severe as to disorganise the cord, then the arms are first involved. |
| No change in sensation, except in severe cases— <i>anæsthesia</i> . | Dissociated <i>anæsthesia</i> for a time. |
| No priapism. | Often priapism. |
| No change in pupils. | Contracted pupils and Horner's syndrome. |
| No change in bladder or rectum. | Retention of urine and <i>fæces</i> . |

Spinal compression is described under tumours and complete lesions under fractures and dislocations.

Classify Tumours of the Spine.

Two main varieties are described, the extra-medullary and the intra-medullary, because they give rise to different clinical pictures.



The symptoms and signs are those of gradually increasing spinal cord compression.

What are the Features of Spinal Cord Compression ?

- (a) SENSORY ROOTS.—Tingling and paræsthesiæ followed by pain and hyperæsthesia and later by anæsthesia with continued pain.
- (b) MOTOR ROOTS.—Rare, early spasmodic twitchings, later flaccid paralysis, muscular atrophy and loss of deep reflexes.
- (c) SPINAL NERVE.—As this is a mixed nerve, there will be a mixture of the above localised to the distribution of the nerve.

(d) SPINAL CORD.—

Sensory changes. Root pains.

Loss of sensation with zone of hyperæsthesia above it.

Motor changes. Weakness of muscles.

Spastic paraplegia.

Sphincters.

Depend on level of lesion.

If above the centres in lumbar region retention of urine followed by overflow and the development of an automatic bladder. Constipation.

If below the lumbar segments incontinence of urine and fæces.

Sub-arachnoid space.

If there is a sub-arachnoid block the fluid below it shows xanthochromia, increased protein, clots on being left in a test tube and there is no increase of pressure on compressing the jugular veins (Froin's syndrome and Queckenstedt's test).

The diagnosis depends on careful neurological examination, lumbar puncture, straight X-rays, and if there is a block the injection of lipiodol and further X-ray examination.

What is the Treatment of Spinal Tumours?

After localisation laminectomy is performed and if operable the tumour is removed.

UPPER LIMB.*Describe Tuberculosis of the Shoulder.*

The disease is uncommon in children and usually occurs in adults who are suffering from pulmonary tubercle. It arises as a rule in the upper end of the humerus and may take the form of caries sicca. In the early stages pain is intermittent, later on it becomes continuous, there is atrophy chiefly of the deltoid, muscle spasm and tenderness. Abscess formation is not uncommon.

In the early stage the joint is held slightly abducted, in the intermediate stage it is flexed, internally rotated and slightly adducted, and in the late stages adducted across the chest.

General sanatorium régime is coupled with immobilisation in abduction in the optimum position and aspiration of any abscess is carried out. Unless a good response is obtained excision of the joint may be required.

Describe “Winged-Scapula.”

This deformity in the majority of cases follows injury to the long thoracic nerve or to the fifth and sixth cervical nerve roots. The rhomboids and serratus anterior are paralysed, and therefore the vertebral border and inferior angle of the scapula are displaced backwards. Abduction at the shoulder-joint is only imperfectly performed. The treatment consists in trying galvanism and massage. In intractable cases, the insertion of the sternal segment of the pectoralis major should be united to the serratus anterior.

Describe Congenital Elevation of the Scapula and its Treatment.

Congenital elevation of the scapula (Sprengel's shoulder) is a rare deformity probably due to non-descent of the shoulder with mal-development of the embryonic shoulder-girdle. In a great many cases the upper angle of the scapula is connected to the transverse process of one of the lower cervical vertebræ by a fibrous band or even a thin strip of bone.

The following are the main clinical points to be noticed :—
(a) high position of the scapula with the superior angle nearer to the vertebral column than normally ; (b) shortening of the clavicle on the affected side ; (c) imperfect development of the lower part of the trapezius ; (d) a certain amount of atrophy of the face, neck, and upper part of thorax on the deformed side ; (e) the range of mobility of the arm is lessened ; (f) shortening of the levator scapulæ and rhomboidei.

Treatment is not satisfactory but an attempt may be

made to divide the fibrous band and shortened muscles and fix the scapula at a lower level.

Describe Tuberculosis of the Elbow.

The disease may commence either in the synovial membrane or in one of the bones of the joint ; bone infection is the commoner. When in bone the humerus is the most frequent source. The leading clinical features are :—(a) pain ; (b) swelling ; (c) tenderness ; (d) rigidity ; and (e) atrophy. Tenderness is noticed on each side of the olecranon. The swelling is doughy and somewhat spindle-shaped in outline. Rigidity is due to muscular spasm ; at a later stage deformity occurs, the arm being held in a semi-flexed position with the thumb pointing upwards.

Abscess formation is common and sinuses and secondary infection may complicate the disease.

In children the results of general treatment plus the immobilisation of the joint are satisfactory, but in adults excision of the joint may be required when conservative measures fail.

Describe Tuberculosis of the Wrist.

The disease most frequently arises in the synovial membrane, but may also originate in the lower end of the radius or one of the carpal bones. The synovial flexor sheaths may also become involved (see p. 286). Pain and swelling with limitation of movement are the signs. X-ray shows decalcification and in many cases extensive erosion of bone.

As well as the usual general measures the wrist is immobilised in plaster with the hand slightly dorsi-flexed and the fingers free. On some occasions healing may be expedited by removing dead or diseased bone from the carpus.

Describe Madelung's Deformity.

Madelung's deformity or manus valga is an occupational deformity mainly affecting laundry-maids and pianists. It

usually occurs during adolescence. Pathologically, there is a subluxation of the inferior radio-ulnar joint, and a slight dislocation of the ulna from the carpus due to rupture of the triangular articular disc. In rickety subjects there is, in addition, a forward curving of the lower part of the radial diaphysis. Viewed from the front, the pisiform and the flexor tendons stand out boldly, while the lower end of the ulna forms a marked prominence on the dorsum of the wrist. Marked pain is generally complained of during the early stages of the condition. The treatment consists in keeping the wrist hyper-extended on a suitable splint for a month, together with massage of the extensor tendons. In severe cases osteotomy of the lower end of the radius should be performed.

What Congenital Anomalies of the Radius Occur ?

The radius may be completely absent or its upper end may be fused to the ulna at varying levels when it is known as congenital radio-ulnar synostosis. Synostosis is diagnosed by the absence of pronation and supination and by the X-ray appearances. Treatment of both conditions is unsatisfactory.

Describe Dupuytren's Contracture.

Dupuytren's contracture is due to a chronic inflammatory thickening of the palmar fascia especially the lateral portions of its digital prolongations. The fat disappears from the affected area, and the fascia becomes adherent to the skin. It is a condition of adult life and affects males more commonly than females. The disease commences as a hard knot in the palm, about the level of the transverse line of flexion, and opposite the root of the ring finger ; the digit is then gradually bent into the palm. The little finger is next affected, and is often more bent than the ring finger ; the remaining digits usually escape. In the affected fingers the first and second phalanges are flexed, and the terminal phalanx extended. Remember that the *tendons* are not involved in the disease.

What is the Treatment ?

In the early stages fasciotomy by Adam's method may be sufficient, but it is wiser to remove the affected fascia by open dissection. The adherent skin may give difficulty and in late cases grafting will be required.

THE LOWER LIMB.**Diseases and Deformities of the Foot.***Describe Ingrowing Toe Nail.*

This painful lesion of the big toe follows pressure from the boot or shoe in most cases, caused originally by bad trimming of the nail. The nail edge digs into the cuticle, causes pressure, ulceration and chronic infection with granulation tissue which is usually exuberant. Both sides of the nail may be affected.

The best treatment is prevention by trimming the nail in a straight line. If infected remove the granulations and pack the nail fold gently back from the nail, and allow healing to occur. In mild cases tin-foil slipped under the nail edge may prevent the condition from becoming worse while the nail grows and it is then cut correctly.

In more severe cases a wedge resection of the nail, nail fold and nail bed is carried out. In extreme and recurrent cases the nail and nail bed are removed completely and a partial amputation of the distal phalanx performed.

What is Onychogryphosis ?

Horny or club nails result from irritation and chronic sepsis or from old injury to the nail bed. The nail becomes coarse, thickened and so hard that cutting is impossible. The treatment is complete removal of the nail and nail bed.

What is a Subungual Exostosis ?

Not uncommonly a small exostosis grows from the upper surface of the distal phalanx of the big toe. It elevates the distal portion of the nail and infection is almost inevitable. The condition is suspected from its site and is diagnosed by X-ray. The exostosis is removed through a small incision parallel to the free edge of the nail.

Describe Hammer-toe.

Hammer-toes usually affect the second toes, and the condition is frequently bilateral. The toe is dorsiflexed at the metatarso-phalangeal joint. The first inter-phalangeal joint is plantar flexed, and the second joint usually dorsiflexed. The head of the first phalanx overlaps the base of the second phalanx. Both the lateral and the glenoid ligaments are contracted. A bursa often forms over the prominent head of the first phalanx, and a hard painful corn develops in the thickened cuticle.

Conservative treatment by manipulation and strapping may suffice in the early stages, but operation is usually required. The corn and bursa are excised and the head of the first phalanx removed and the deformity corrected.

Describe Hallux Rigidus.

A painful condition of the metatarso-phalangeal joint of the big toe which may occur in an otherwise normal foot or be associated with foot strain or pes planus. At first there is loss of dorsiflexion of the toe with pain and swelling of the joint. Later chronic arthritic changes occur. In some cases there is a flexion contracture of the toe—*hallux flexus*. Treatment in the early stages by the insertion of a steel in the sole to limit the movements of the joint is satisfactory, but later operation is required. The base of the first phalanx is excised and an arthroplasty performed.

Describe Hallux Valgus.

Hallux valgus may arise from several causes, the chief being—(a) the wearing of narrow-pointed and improperly fitting boots; (b) removal of the second toe; and (c) a varus deformity of the first metatarsal bone. The toe becomes abducted from the middle-line of the body, the head of the first metatarsal forms a marked prominence, the internal lateral ligament is elongated, while the external lateral ligament shortens. A bunion develops between the internal lateral ligament and the soft structures.

This bursa is liable to become acutely inflamed. In mild cases shoes of suitable type will be sufficient, in more severe cases the bursa and extostosis may be removed. In cases with arthritis of the metatarso-phalangeal joint the Mayo or Girdlestone operations may be employed.

Describe Congenital Digiti Quinti Varus.

A deformity of the little toe which is displaced medially at the metatarso-phalangeal joint and comes to overlap the other toes. Corns and pain result from the pressure of the boot and devitalisation of the moist area of contact between the toes may even cause ulceration. In mild cases the deformity may be corrected by operation. In severe cases a bursa develops over the metatarsal head and the toe and bursa are usually excised.

Describe Osteo-chondritis of the Second Metatarsal Head.

Köhler's disease or Freiberg's infraction of the second metatarsal head occurs chiefly in females in late adolescence and early adult life. There is pain and tenderness over the head of the bone and anomalies of the big toe and first metatarsal are frequently associated with it. At first the X-ray shows flattening of the head of the bone with some sub-chondral rarefaction. In later years there is gross arthritis with broadening of the head and its distal surface becomes ω shaped.

In the early stages healing with little deformity may follow immobilisation or the relief of weight bearing by a metatarsal pad. In the late stages, if a metatarsal bar does not give relief, the head of the bone may be excised.

The third metatarsal head may be affected alone or as well as the second.

Describe March Foot.

March fracture or pied forcé affects the second metatarsal chiefly, but is also found in the third. After unaccustomed or excessive walking or marching there is sudden severe pain over the shaft of the second metatarsal. The injury is suspected by the acute but localised tenderness. X-ray in the early stages shows a minute crack in the bone which may be missed. If walking be continued abundant callus is formed as a fusiform swelling. The X-ray must not be confused with inflammatory or neoplastic changes. Displacement never occurs.

Treatment by rest in the early stages will prevent the excessive callus formation.

Tuberculous Dactylitis is described on page 49.

Describe Köhler's Disease of the Navicular.

This is an osteochondritis affecting the tarsal navicular bone which occurs chiefly in boys about four years of age. The child complains of pain in the foot and usually a limp is the first sign. There is tenderness and sometimes swelling over the bone. X-ray shows irregular sclerosis and narrowing of the bone.

The foot is immobilised in plaster until radiological healing is complete.

Describe Metatarsalgia.

This is the name given by Morton to anterior flat foot with spasmodic pain under the metatarsal heads. It is common

in women. Callosities are found under the metatarsal heads.

A metatarsal pad and strapping or metatarsal bar and excercises and manipulation of the toes comprise the treatment, but other foot disabilities should receive attention.

What are the Agents concerned in maintaining the Arch of the Foot ?

- (a) The long plantar ligament.
- (b) The short plantar ligament.
- (c) The inferior calcaneo-navicular or spring ligament supporting the head of the talus.
- (d) The plantar fascia.
- (e) The tendon of the tibialis posterior attached to the tuberosity of the navicular.
- (f) The tibialis anterior.
- (g) Last, but not least, the tonic contraction of the muscles of the sole.

Describe Pes Planus.

Flat foot is an abduction and eversion deformity of the foot which may be due to a variety of causes, *e.g.* overweight, faulty posture, strain of the foot from prolonged walking or standing and paralysis. It may be divided into five types :—

- (a) *Mobile flat foot* in which the deformity can be corrected by the voluntary contraction of the patient's muscles.
- (b) *Semi-rigid or resistant flat foot* in which the deformity can be corrected by manipulation.
- (c) *Rigid flat foot* in which an anæsthetic and some degree of force are required to correct the deformity.
- (d) *Flat foot with bony deformity* requiring a bone operation for its correction.

- (e) *Flat foot with peroneal spasm.* Types (a) or (b) may be associated with spasm of the peronii which are visible as tense bands. Correction under anæsthesia is possible, but relapse is common.

Where is Pain chiefly felt in Flat Foot ?

- (a) At the inner and inferior aspect of the foot—over the inferior calcaneo-navicular ligament.
- (b) Across the dorsum of the foot from the pressure of the talus against the navicular.
- (c) On the outer side of the foot, from the pressure of the external malleolus on the calcaneus.

What is the Treatment ?

In the first two stages shoes or boots of suitable size and shape are raised on the inner side of the sole $\frac{3}{16}$ inch and exercises and faradic foot baths are given. If the patient has much standing to do a sponge rubber support is of value, but if its use is likely to be of short duration strapping may be used as a temporary measure. The rigid foot may be manipulated and after securing full mobility the arch is moulded and plaster applied in full varus of the foot. After removal of the plaster in six weeks the treatment is that of the earlier types. Bone changes require bone operations unless the foot is painless.

Spastic flat foot requires plaster in the full varus position, but at the same time a search should be made for focal sepsis, *e.g.* tonsils, and treatment given.

Describe Talipes Equino-Varus.

This is a deformity of the foot, congenital or acquired, in which the sole of the foot looks inwards and the heel is raised from the ground.

Acquired cases are most frequently due to infantile paralysis ; the deformity may, however, follow division of the lateral popliteal nerve.

Contrast the Congenital and Acquired Forms.

| | CONGENITAL. | ACQUIRED. |
|---------------------------|--|---|
| <i>History</i> . | From birth. | Paralysis in childhood. |
| <i>Feet affected</i> | Usually bilateral. | Unilateral. |
| <i>Circulation</i> . | Normal. | Limb cold and bluish. |
| <i>State of muscles</i> . | Slight wasting. | Marked wasting. |
| <i>Reaction</i> . | Unaltered. | Reaction of degeneration for a time. |
| <i>Bone changes</i> | Structure normal, but shape altered. | Osteoporosis with subsequent alteration of shape. |
| <i>Appearance</i> . | Transverse crease on sole. Pressure scars over the external malleolus. | No transverse crease. |
| <i>Trophic changes</i> . | <i>Nil.</i> | Frequent attacks of chilblains. |

Give the Chief Anatomical Changes.

MUSCLES.

- (a) Extensor tendons displaced inwards.
- (b) Contraction and shortening of gastrocnemius and soleus.
- (c) Contraction of the two invertors, namely, the tibiales anterior and posterior.

FASCIÆ.

Contraction of—

- (a) Inferior calcaneo-navicular ligament.
- (b) Posterior ligament of ankle.
- (c) Deltoid ligament of ankle.
- (d) Plantar fascia.

BONES.

- (a) Cuboid and navicular rotated inwards.
- (b) Tuberosity of navicular approximated to internal malleolus.
- (c) Inferior third of tibia rotated inwards.
- (d) Marked prominence of head of talus and greater process of calcaneus.

Describe the Treatment of Talipes Equino-Varus.

Treatment should be begun as soon as possible. The three deformities, *i.e.* the equinus, the adduction and inversion, and the internal rotation of the tibia, are corrected by daily manipulation and the foot held for some time in the optimum position secured. This position may be maintained by a lateral splint or a Dennis-Browne splint is applied.

In older children or if the first method is unsuccessful plaster is applied following manipulation, and the deformity is further corrected by wedging.

When the child begins to walk relapse may be prevented by the wearing of a suitable night splint, *e.g.* Dennis-Browne's.

In some cases tenotomy of the tendo Achilles may be necessary to correct the equinus deformity.

In late cases it may be necessary to separate all the structures on the sole and inner side of the foot from bone to correct the deformity by manipulation and in adults a bone operation will be required.

Give the Causes of Talipes Equinus.

- (a) Congenital—very rare.
- (b) Spastic paralysis—the condition is bilateral.
- (c) Infantile paralysis, where the extensor group of leg muscles are involved.
- (d) Compensatory to congenital dislocation of the hip.
- (e) Peripheral neuritis.

- (f) Pressure of bed-clothes on the toes, talipes decubitus ; a very doubtful cause.
- (g) Extensive burns or injuries to the calf muscles—the resulting cicatrization pulling up the heel.

What are the Degrees of Claw-foot (Pes Cavus) ?

First Degree.—Inability to dorsiflex the ankle beyond a right angle ; slight contraction of the tendo Achilles.

Second Degree.—Flexion at the mid-tarsal joint. Big toe dorsiflexed at the metatarso-phalangeal joint. Tendo Achilles and plantar fascia contracted.

Third Degree.—All the toes dorsiflexed at the metatarso-phalangeal joints, and becoming rigid. Plantar fascia and tendo Achilles contracted.

Fourth Degree.—Same as the preceding degree, together with a varus deformity.

Fifth Degree.—Similar changes to the third degree ; in addition equino-varus is present.

What are the Causes ?

It may be congenital or acquired. It may be the result of poliomyelitis or may be associated with spina bifida. In many cases there is no discoverable cause.

What is the Treatment ?

In mild cases a low heel and metatarsal bar may be sufficient or tenotomy of the plantar fascia may be required.

In more severe cases Steindler's or Lambrinudi's operation may be carried out and extreme cases with rigidity may require wedge tarsectomy.

The Leg and Thigh.

Describe Tuberculosis of the Ankle.

The disease may originate either in synovial membrane or in bone, the upper surface of the neck of the talus

being the commonest bony focus. The disease gradually involves the long tendons on the dorsum of the foot. The leading signs and symptoms are :—

- (a) Patient walks with a limp.
- (b) Tenderness on the anterior and lateral aspects of the joint.
- (c) Pain is readily elicited by tapping on the heel, or by extending the ankle.
- (d) A typical deformity develops, the foot assuming an equinus attitude with the toes pointing.
- (e) Swelling round the joint especially on both sides of the tendo Achilles.
- (f) X-ray shows erosion of the articular cartilage and marked atrophy of the tarsal bones.

What is the Treatment ?

General measures. Immobilisation in plaster for a year or more but abscess formation is frequent and the results of excision are not good. In adults amputation should be considered.

What is Osgood-Schlatter's Disease ?

This condition is described by some as an osteochondritis and by others is attributed to sudden or repeated traction on the ligamentum patellæ causing a partial separation of the tibial tuberosity. There is pain on extending the knee with some swelling and tenderness over the tuberosity. X-ray shows some fragmentation and slight separation of the bony process.

Rest in a splint or plaster brings about cure, although operative fixation by a screw or bone graft has been advocated in America.

What is Genu Valgum ?

Genu valgum or “ knock-knee ” is a condition in which the leg joins the thigh at an angle opening outwards. It is

due to the ossifying junctions of the femur and tibia growing unequally as a result of rickets. The deformity vanishes on flexing the knee as the posterior femoral articular surface is not affected.

In the acute stage of rickets general treatment (p. 52) and correction by manipulation and splinting are required. Later when the deformity is established osteotomy is performed.

What is Genu Varum ?

Genu varum is the opposite deformity to genu valgum, i.e. "bow leg." It is the result of distortion of the softened bones of rickets by the body weight. The femur is not usually affected, the bending and internal rotation of the leg occurring above the lower third of the tibia.

The deformity is easily recognised. It should be prevented by recumbency and splinting and manipulation in the active stage, but when it has become established closed fracture of the tibia by an osteoclast or osteotomy will be required.

What is Genu Recurvatum ?

Hyperextension of the knee may be congenital or acquired, but is essentially due to weakness of the quadriceps and is an attempt to secure stability by locking the knee. The posterior ligaments become elongated and the anterior structures contracted. Treatment may be by gradually increasing flexion or by operative methods such as arthrodesis or a bone block operation.

Recurrent Dislocation of the Patella and Injuries of the Menisci are described on p. 123 *et seq.*

Describe Tuberculosis of the Knee Joint.

The condition most frequently arises in the synovial membrane, but may originate from a bony focus in the

femur or tibia. When primarily in the synovial membrane secondary bone foci may follow in the back of the lower epiphysis of the femur. The leading clinical features are :—

- (a) Pain—an inconstant finding in the early stages.
- (b) Limping.
- (c) Muscle wasting of thigh.
- (d) Gradual flexion deformity with spasm of hamstrings.
- (e) Swelling above and around patella due to fluid or synovial thickening.
- (f) When the granulations have invaded the articular surface of the femur there will be no patellar click.
- (g) In late cases backward displacement of the tibia occurs and is often accompanied by external rotation deformity.
- (h) X-rays show merely general decalcification. It is only in the later stages that destructive changes and erosion of the bony surfaces are visible.

The diagnosis in the early stage may be very difficult and it is wiser to treat the condition as tuberculosis until it is proved otherwise.

Give the Treatment.

General sanatorium measures. Traction to overcome the muscle spasm and relieve the pain is followed by prolonged immobilisation in plaster. Should bony disease occur the best result will probably be ankylosis in the optimum position. Sometimes lengthening of the affected leg occurs. In adults excision of the joint or amputation may be necessary.

Describe Coxa Vara.

A condition in which the angle of the neck of the femur is less than normal, which is about 130° . The deformity may be either unilateral or bilateral and is chiefly met with in young boys. The commonest period for the deformity is between the ages of thirteen and seventeen. The deformity may be due to changes in the head (capital), epiphysis

(epiphyseal) or neck (cervical) of the femur and it may be due to a variety of causes, *e.g.* bone disease such as rickets or osteomalacia, arthritis, fractures or slipping of the upper epiphysis of the femur. This last type is of great importance. The signs and symptoms are :—

- (a) Early fatigue, pain and stiffness on walking.
- (b) Waddling limp.
- (c) Shortening of affected limb.
- (d) Prominence of great trochanter.
- (e) Flattening of buttock.
- (f) Adduction and external rotation of limb. Abduction limited.
- (g) Trendelenberg's test (see below).
- (h) X-ray examination reveals the cause, *e.g.* slipped epiphysis and helps to exclude congenital dislocation, Perthes disease, etc.

If possible the cause of the deformity is treated and in cases of the epiphyseal type traction and manipulation are followed by fixation. In long established coxa vara subtrochanteric osteotomy is required.

Describe Perthes Disease of the Hip.

Pseudocoxalgia is an osteochondritis (p. 56) of the head of the femur occurring in children. The symptoms and signs are :—

- (a) Insidious onset in healthy child.
- (b) Painless limp with perhaps slight ache in hip or knee.
- (c) Little muscle wasting.
- (d) Limitation slight of all movements but abduction affected most.

The diagnosis is made by radiology, the changes having already been described. The treatment is traction followed by immobilisation and no weight bearing without support until radiological healing has occurred. Failure to avoid weight bearing leads to flattening of the femoral head

(coxa plana) and the subsequent development of chronic arthritis.

Describe the Pathological Anatomy of Congenital Dislocation of the Hip.

The acetabulum is very shallow, especially in its postero-superior part, triangular in outline and almost obliterated by fibrous tissue. The femoral head is small or even absent, is frequently conical and is usually displaced backwards on to the dorsum ilii where a depression is formed—the false acetabulum. The femoral neck is shortened, anteverted and its angle is lessened. The ligaments are thickened and elongated and the capsule hour-glass shaped.

All the horizontal muscles of the buttock, *i.e.* gemelli, piriformis and obturators are stretched, while the hamstrings and adductors are contracted. The glutei are not affected.

What are the Chief Clinical Features ?

The condition is most frequently found in females and it may be unilateral or bilateral. In the majority of cases it is not noticed until the child begins to walk.

| UNILATERAL CASES. | BILATERAL CASES. |
|---|---|
| Slight degree of scoliosis, the concavity being on the dislocated side. | Well-marked lordosis and prominent belly. |
| Limp on walking. | Waddling gait. |

In both cases, in addition, note :—

- (a) Gluteal folds short and deep. Widening of perineum.
- (b) Shortening of the limb.
- (c) No pain.
- (d) Abduction limited.
- (e) Great trochanter above Nélaton's line.

- (f) Telescopic movement.
- (g) The vascular sign—femoral artery difficult to feel as unsupported.
- (h) Trendelenberg's test.—Normally, if a person stands on one leg the buttocks remain on the same level. In congenital dislocation, if the patient stands on the affected limb, the buttock of the sound side drops.
- (i) X-ray reveals the dislocation, the shallow acetabulum and the hypoplasia of the postero-superior margin and differentiates the condition from pathological dislocation following arthritis.

What is the Treatment ?

The dislocation is reduced at as early an age as possible and the limb is put in plaster in the "frog" position. The abduction and flexion are slowly lessened and the limb internally rotated over a period of six months. Progress is followed by X-rays. If the acetabular margin develops well walking may be begun ; if it remains hypoplastic a shelf grafting operation is required.

In some cases reduction is impossible and open operation is required.

Describe Tuberculous Disease of the Hip.

Tuberculous disease of the hip joint most commonly occurs before the age of ten. It usually commences in one of the articular surfaces, either the posterior aspect of the neck of the femur, or at the attachment of the ligamentum teres to the floor of the acetabulum. Subsequently absorption ensues, the femoral head becoming markedly flattened and attenuated, while the acetabulum extends upwards and backwards ("wandering acetabulum").

What are the Clinical Features ?

Three stages are described :—

STAGE I.—There is usually a history of injury to the joint.

The patient complains of pain and walks with a slight

limp, dragging the affected limb. *Limping at first is usually intermittent.* The pain may be referred to the knee-joint. Stiffness is found on rising in the morning. It is probably due to a diminished secretion of the synovial fluid.

On examination notice slight flattening of the buttock, and perhaps a loss of the gluteal fold. Owing to the contraction of the surrounding muscles, hyperextension, abduction, and rotation are diminished. *For detecting limitation of rotation, flex the hip to a right angle.*

X-ray examination may show some general decalcification or no apparent change in the bone.

STAGE II.—The patient presents a characteristic attitude, the affected limb being *flexed, adducted, and everted*. This is partly a reflex and partly of a voluntary character.

Due to the tilting of the pelvis there is apparent lengthening of the same leg.

[*N.B.*—To demonstrate the obliquity of the pelvis draw a horizontal line joining the anterior superior iliac spines, and a vertical line from the umbilicus to the symphysis pubis ; the two lines will *not* meet at right angles.]

Lordosis of the spine is present. This can be tested by laying the patient flat upon a table, and on flexing the diseased hip the lordosis disappears, returning, however, when the hip is again extended. To demonstrate the degree of flexion, employ Thomas' test. Lift up the sound thigh, the lordosis disappears and flexion occurs on the affected side ; the angle of flexion is the angle between the diseased thigh and the table.

X-ray now shows well marked decalcification and it may be possible to make out a bony focus.

STAGE III.—Starting pains at night are generally present. The patient's diseased limb is *flexed, adducted, and inverted*. Apparent or real shortening is found.

X-ray will now reveal erosion of the articular cartilage of the femoral head or acetabulum or both.

What is the Treatment ?

The usual general measures. Local treatment aims at the relief of pain and the correction of deformity and spasm by traction followed by immobilisation in plaster for about two years. Even the mild or early case is so frequently followed by ankylosis that extra-articular arthrodesis is frequently carried out when the disease is quiescent.

Describe Tuberculous Disease of the Sacro-iliac Joint.

This condition is rarely found in children. The primary focus is usually in the ilium. The leading clinical features are :—

- (a) Pain and weakness in the back—worse on over-strain. It may be brought on by attacks of sneezing or coughing. The pain is often referred down the legs.
- (b) Pressure on the ilia, or forcibly separating these bones causes great pain.
- (c) Limp on walking.
- (d) Patient walks with a characteristic gait, swinging the affected side forwards. The anterior superior iliac spine on this side appears unduly prominent.
- (e) Apparent lengthening of the diseased side.
- (f) Abscesses may form—often burrowing into the pelvis.

Treatment is by general measures and by prolonged immobilisation in a plaster shell or bed. The best result is fixation of the joint and cure may be hastened by operation.

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